CALIFORNIA
OIL WORLD
and Petroleum Industry

THE AUTHORITY ON THE CALIFORNIA OIL INDUSTRY

FIRST ISSUE
JANUARY 1941
VOL. 34 NO. 1
WHOLE NO. 1576

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California Oil World and Petroleum Industry is published twice a month at 828 Petroleum Bldg., 714 West Olympic Blvd., Los Angeles, California. Entered as Second-class Matter January 1, 1937, at the post office at Los Angeles, California, under the Act of March 3, 1879. Subscription price: $1 per year in U. S. and Possessions, $2 in foreign countries, including Canada. Member of the Audit Bureau of Circulations.

January 14, 1941

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YOUNGSTOWN SHEET and TUBE COMPANY

. . . announces that effective January 1, 1941 Youngstown Oil Country Pipe will be distributed in California exclusively by its wholly owned subsidiary The Youngstown Steel Products Co.

Offices will be maintained in The Petroleum Building, 714 West Olympic Boulevard, Los Angeles . . . Telephone PRospect 7581.

E. Eng. Lib
Chem. Eng.

Record 1940 Consumption, New Chemicals

Prove Defense Capacity of Oil Industry

By
Axtell J. Byles
President American Petroleum Institute

Ability of the petroleum industry to take its place in the national defense program with fewer readjustments than any other basic industry was indicated again by the 1940 production and consumption of petroleum products. Although these demands exceeded by a substantial margin all previous records in the history of the industry, they easily were filled without straining of capacity.

Not only is the petroleum industry ready, with minor changes, to fill all normal and anticipated increased needs for its own vitally-important products, government surveys of its capacities have revealed, but in 1940 it began the commercial production from petroleum of synthetic substitutes for other essential substances, chief among them toluene, rubber, and glycerin. The United States alone, among the nations of the world, can produce the quantities and qualities of super aviation fuel needed for maximum military effectiveness.

Virtually every production, manufacturing, and consumption record of the industry was broken in 1940, the year-end analysis reveals. More oil was produced, more refined products were manufactured, and the United States consumed more petroleum products, than ever before in the 80-year history of the industry. U. S. consumption averaged almost 1,800 gallons per family.

Underground oil reserve inventories at the beginning of the year were higher than at any previous time, reflecting oil discoveries that during the last five years have been more than twice as great as production. The price of the industry's chief product, motor fuel, declined to the lowest point, except for 1933, since 1919, although the highest average gasoline taxes ever levied kept at a high level the cost of motor fuel to the consumer.

The modern refining processes, like catalytic cracking, polymerization, alkylation, isomerization, and aromatization, which have been responsible for the production of the finest aviation fuels and for the synthetic rubber, toluene, glycerin, and other basic industrial chemicals, were extended and improved during 1940. Many of these processes use as a raw material the by-product refinery gases which until relatively recently had no apparent use except as a heating fuel.

During 1940 the industry began to feel the full effects of the war. Exports, contrary to the expectations of some, declined materially from 1939. Loss of Central European markets, strict rationing of petroleum products throughout most of the world outside the Western Hemisphere, availability of substantial Asian and South American supplies to Great Britain and her allies, governmental embargoes of some products, and the use of exchange

Meeting Jan. 7, in Los Angeles, the gas engine sub-committee of the American Petroleum Institute Division of Production heard an interesting discussion of the rise of the "spark plug rig". At the speakers' table, left to right, were: Dewey Barber, Charles Ward, Roy Hitchcock, Nick A. D'Arcy, Jr., R. M. Kettenberg, retiring chairman, and H. Wirshing.

At this A.P.I. meeting in Los Angeles last week, members of the Division of Production heard a paper authored by Roy Hitchcock and Nick A. D'Arcy, Jr. Title of the paper was "Application of Multi-Cylinder Combustion Engines for Drilling Rigs."

credits for products not available elsewhere undoubtedly account for the large declines. Motor fuel exports particularly were affected and dropped more than 40 per cent from 1939, because of decreased foreign purchases and, to some extent, the embargoes and export licensing of our own government. Crude oil shipments abroad declined 24 per cent, and refined products as a whole, 32 per cent.

As usual, the industry continued to find itself in the goldfish-bowl of governmental investigation. Testimony by oil-state executives and industry experts before the Cole Committee early in 1940 detailed the conservative progress made by the industry itself and by state regulation in most of the leading oil states, and showed that no emergency or lack of adequate conservation warrant the federal control of the industry which the Cole Bill seeks. The Interstate Oil Compact Commission continued to strengthen its conservation activities during the year. With the decline in production in Illinois, only major oil state without some legislative or voluntary oil conservation control, enactment soon of adequate state regulation there is forecast.

A survey of the capacity of the petroleum industry late in 1940 by Dr. Robert E. Wilson, industry representative on the advisory commission to the Council of National Defense, revealed that "no industry of comparable importance to defense has so few potential bottlenecks as has the petroleum industry."

Committees of the American Petroleum Institute, appointed at the request of the commission, already have begun consideration of oil-storage defense problems.

Crude-petroleum production increased nearly 7 per cent in 1940 to 1,354,423,000 barrels, compared with 1,264,962,000 barrels in 1939, preliminary estimates indicate. Outside the United States, however, a decline of 2 per cent dropped production to an estimated 795,318,000 barrels, for a world total production of 2,149,-741,000 barrels. The U. S. proportion of the world total therefore increased slightly, to 63 per cent. Under conservation regulations, wells in many leading oil states are producing at only a fraction of their immediately-potential capacities; in an emergency they could be opened up at a moment's notice to meet any conceivable increased needs.

The country's refineries processed 1,291,516,000 barrels of crude oil in 1940, an increase of 4 per cent over 1939. These crude runs did not nearly reach the refinery capacity which, on January 1, 1940, totaled 4,721,213 barrels daily. The shutdown capacity alone, 431,952 barrels daily, it has been pointed out, is greater than the entire refining capacity of the industry in 1917.

Production of motor fuel in 1940 totaled 614,459,000 barrels, against 611,043,000 barrels in 1939. Light fuel oils (gas oil and distillates) rose more than 10 per cent, to 179,123,000 barrels, and residual fuel oil 3 per cent to 316,668,000 barrels.

Domestic demand for motor fuel increased 6 per cent, from 555,509,-000 barrels in 1939 to 590,737,000 barrels in 1940. Motor-fuel exports, however, dropped to 24,919,000 barrels from 44,638,000 barrels in 1939, a decrease of 44 per cent. Consumption of light fuel oils showed the greatest increase of any of the major petroleum products, a gain of more than 18 per cent to 164,571,000

barrels. This reflects the continually growing demand for heating oil for domestic oil burners. Increased installations of these burners combined during the early part of 1940 with weather much colder than in 1939 to increase consumption tremendously.

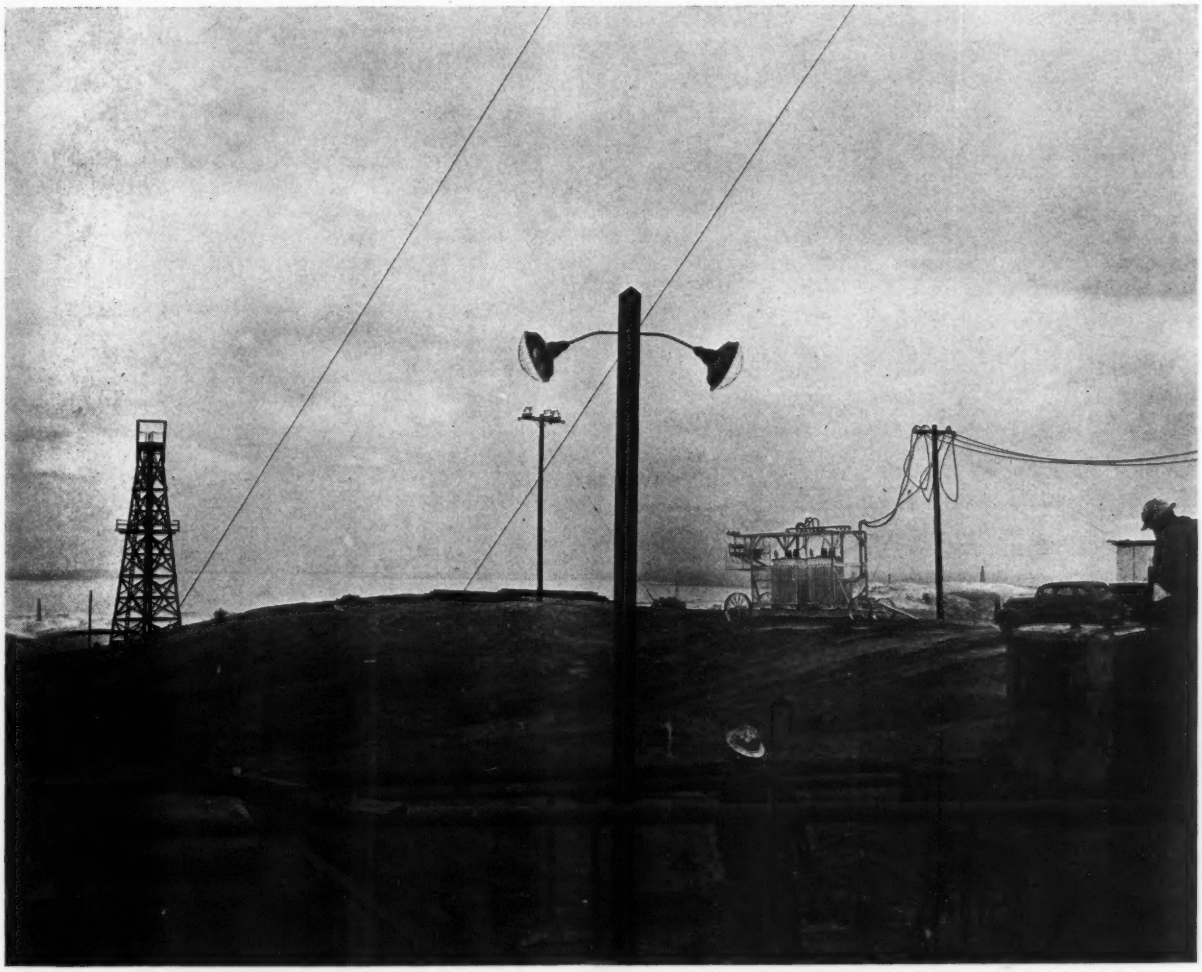
Drilling of wells increased 9 per cent from 1939, to 30,264 wells; of these 21,277 were completed as oil wells, and 2,224 as gas wells. The amount of crude oil in storage at the end of the year rose by 321,000 barrels to an estimated 263,000,000 barrels; at the end of 1939 these stocks had dropped to the lowest point in 18 years. Crude-oil prices, as indexed by the 36-degree Oklahoma-Kansas price, remained at $1.02 a barrel throughout 1939; no estimates of the nation-wide average per-barrel price are available, but it is expected to approximate the 1939 average, $1.02.

Wholesale prices of petroleum products, according to the U. S. Bureau of Labor Statistics, again were far below the average for all commodities, and dropped 4 per cent in 1940 from 1939. The 1940 petroleum-product average was 50.0, compared with 78.3 for all commodities. These indexes are based on 1926 as 100.

The average retail price of motor fuel in 50 representative U. S. cities dropped in 1940 to the lowest level, except for 1933, since prices first were collected in 1919. The year's average was 12.75 cents, compared with 13.31 cents in 1939, the all-time low of 12.41 cents in 1933, and the all-time high of 29.74 cents in 1920. The highest average gasoline taxes ever levied, 5.66 cents a gallon, kept at a high level in 1940 the cost of motor fuel to the consumer.

Total gasoline taxes have increased steadily in recent years, passing the billion-dollar mark for the first time in 1939. It is estimated that state and federal gasoline levies in 1940 amounted to $1,146,000,000, of which $868,000,000 was contributed to the states and $278,000,000 to the federal government. The federal levy represents an increase of one-third over 1939, reflecting the 50 per cent increase in the tax (to 1½ cents a gallon) effective July 1, 1940. Total petroleum taxes, it is estimated, amounted nearly to $1,500,000,000.

The average motor vehicle, it is estimated, consumed 740 gallons of



In these Buena Vista hills a record is being set for deep drilling with electric power. Honolulu is well below 11,000 ft. on this test.

motor fuel in 1940, an increase of 12 gallons from 1939, and of 240 gallons from 1920. Price of the 740 gallons bought in 1940, however, on the average, was only $94.35, compared with a total 1920 cost for only 500 gallons of $148.70. Taxes in this same period increased, for the average motor vehicle, from 45 cents in 1920 to $41.88 in 1940, equivalent to a cost-increase of more than 44 per cent for the consumer on his 1940 fuel bill.

These and other statistical data of the petroleum industry, comparing 1940 estimates (most of them based on 10-months figures) with records of recent prior years, are in the following tables:

Foreign Trade in U. S. Crude Petroleum (in bbls. of 42 gal.)

Year	Imports	Exports
1934	35,558,000	41,127,000
1935	32,239,000	51,430,000
1936	32,327,000	50,313,000
1937	27,484,000	67,234,000
1938	26,412,000	77,254,000
1939	33,095,000	72,076,000
1940 (est.)	41,673,000	54,721,000

Crude Oil Run to Stills (in barrels of 42 gallons)

Year	
1934	895,636,000
1935	965,790,000
1936	1,068,570,000
1937	1,183,440,000
1938	1,165,015,000
1939	1,237,840,000
1940 (est.)	1,291,516,000

Production of Crude Petroleum (In barrels of 42 U. S. gallons)

Year	United States	Rest of World	Total World
1934	908,065,000	613,380,000	1,521,445,000
1935	996,596,000	658,092,000	1,654,688,000
1936	1,099,687,000	702,099,000	1,801,786,000
1937	1,279,160,000	762,878,000	2,042,038,000
1938	1,214,355,000	753,332,000	1,967,687,000
1939	1,264,962,000	811,810,000	2,076,772,000
1940 (est.)	1,354,423,000	795,318,000	2,149,741,000

Wells Completed in the United States

Year	Oil	Gas	Dry	Total
1934	12,520	1,368	4,309	18,197
1935	15,108	1,401	4,911	21,420
1936	18,523	2,070	5,297	25,890
1937	23,678	2,695	6,432	32,805
1938	19,286	2,066	6,141	27,493
1939	19,045	2,198	6,474	27,717
1940 (est.)	21,277	2,224	6,763	30,264

Crude Oil in Storage at End of Year (in barrels of 42 gallons)

Year	
1934	337,254,000
1935	314,855,000
1936	288,579,000
1937	306,826,000
1938	274,958,000
1939	239,978,000
1940 (est.)	263,000,000

Capacity of U. S. Refineries (Operating, shut-down, and building as of Jan. 1.)

Year	Capacity (Bbls. per day)
1935	4,072,400
1936	4,163,946
1937	4,376,081
1938	4,373,701
1939	4,650,805
1940	4,721,213

State Gasoline Income Sets Record in 1940

Assurance that income from California's gasoline tax would establish an all-time record during 1940 was given recently by Richard E. Collins, Chairman of the State Board of Equalization.

In a report covering motor vehicle fuel distribution for the month of November, Collins pointed out that the tax on a gallonage of 159,978,119 amounted to $4,799,343.57 for the month. This represented a gain of 3.70 per cent over the same month of the previous year.

Board records show that with the November total the gasoline tax already amounts to $51,991,178.85 for the year. The previous high yearly total of $54,323,050.98, established in 1939, will be surpassed by a substantial margin when the December 1940 figures are included.

The November total was slightly under the October income which amounted to $4,978,381.29. It was the twentieth consecutive month that gains had been shown over comparable periods of previous years.

Tidewater Man Called to Active Duty

Emory B. Bronte of San Francisco, Lieutenant Commander in the Naval Aviation Reserve Corps, has been called to active duty under the Chief of Naval Operations according to word received recently from Washington, D. C. The assignment given Mr. Bronte is as an active Lieutenant Commander assigned to the Priorities Committee of the Army and Navy Munitions Board with headquarters at Washington.

In July of 1927 Mr. Bronte served as navigator for Ernie Smith on the first civilian non-stop flight from the mainland to the Hawaiian Islands. Later that year he entered active work in the field of aviation at the Oakland Naval Reserve Air Base and his advancement in the reserve corps was rapid. He gained his commission as a Lieutenant Commander in January, 1938.

For the past thirteen years Mr. Bronte has been employed with the Tide Water Associated Oil Co. He started work as a special representative of the company in 1927, subsequently serving as a special aviation representative and later was manager of aviation sales. In 1933 Mr. Bronte was named San Francisco sales agent for Associated and in February, 1940, was promoted to the position of San Francisco District Sales Supervisor. He has been granted an extended leave of absence from his employment in order to answer the call to active duty in Washington.

W. E. Long Dies At L. B. Hospital

William Earl Long, age 49, better known to his friends as "Bill" Long, passed away of a heart complication in a Long Beach hospital on Jan. 4, 1941.

For many years connected with the California Western Oil Co. and the Havenstrite interests, Mr. Long enjoyed a long and varied career within the industry.

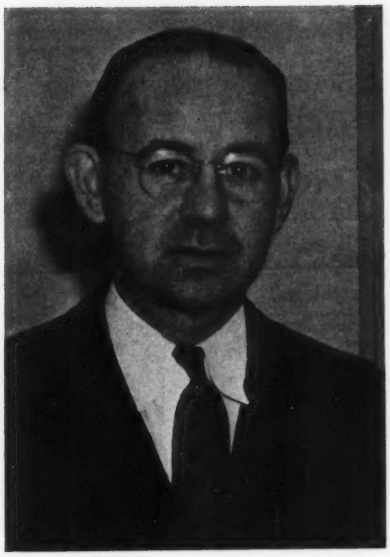
He is survived by Mrs. Long and three children, all of Long Beach.

Soviet geologists have found oil in western Siberia.

Plastic pipe illuminates dials and meters.

W. E. Watson

J. A. Crawford



J. W. Schmid

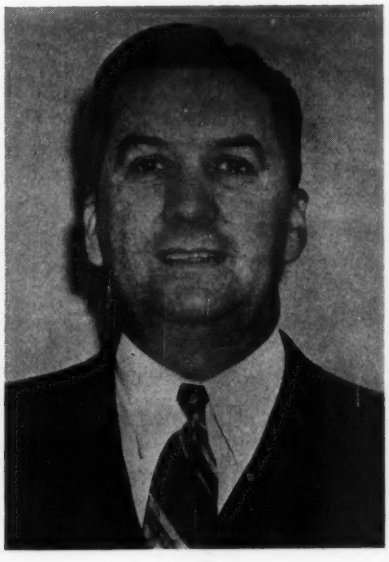
Youngstown Expands California Operations

The Youngstown Sheet and Tube Co. announces that effective January 1, 1941 Youngstown Oil Country Pipe will be distributed in California exclusively by its wholly-owned subsidiary The Youngstown Steel Products Co.

W. E. Watson, vice president of The Youngstown Sheet & Tube Co. states that the company has purchased the Wilmington Pipe Yard formerly owned by The Republic Supply Company of California and that Los Angeles offices will be maintained in the Petroleum Building, 714 West Olympic Boulevard.

J. A. Crawford, who resigned his position as President of The Republic Supply Company of California will be in charge of California operations. Other members of the organization will be J. W. Schmid, L. B. Wiggins, R. I. Whelan, and G. E. Pitts.

L. B. Wiggins



R. I. Whelan

G. E. Pitts

S. J. Dickey General President A. L. Weil Retires After 30 Years

Official presentation of Samuel Jackson Dickey as the new president of General Petroleum Corp. and special tribute to former president A. L. Weil, retiring after 30 years in the service of the corporation, were among outstanding features of a banquet given Friday evening, Jan. 10, at the Ambassador Hotel, Los Angeles. Also officially announced were the recent elections of Fred Isaacs, manager of the company's Mobilgas refineries, and Robert Lee Minckler, assistant to the president, to membership on the board of directors.

S. J. DICKEY

A. L. WEIL

In reality, the banquet was given in honor of Retiring President Weil, who was presented with a handsome brochure carrying tributes and signatures of all persons connected with the corporation throughout its production, manufacturing and marketing areas of the Pacific West. Mr. Weil was lauded for his instrumentality in placing General Petroleum Corp. among leading oil companies.

Colorful Career

Former President Weil, one of the most popular and widely known oil men in the country, retired from active work after a long and colorful career in the oil industry. This period of service dates back to his graduation from the University of California in 1899. He began his activities in the interest of General Petroleum at the inception of the company in 1910, when he was made general counsel and drew the incorporation papers for Captain John Barneson, the founder.

At that time Mr. Weil was engaged in the practice of law, specializing in matters pertaining to public lands. During this law practice he has served as attorney for many oil companies. He was one of the organizers of the Kettleman-North Dome Association, the first unit development covering the largest oil fields in California.

In 1933, after 23 years of active and valuable service in the development of General Petroleum Corporation, Mr. Weil was elected to the presidency to succeed J. A. Brown, who had been called to New York to serve the parent organization, the Socony-Vacuum Oil Company, as president of that corporation.

New President of Broad Experience

Samuel Jackson Dickey, newly elected president, has been associated with General Petroleum for 21 years, having first joined the company in 1919 as refinery engineer. In 1920 he was made chief engineer of the corporation; in 1927 he was elected a director; and in 1930 he was made vice president in charge of manufacture, embracing direction of refineries, natural gasoline plants, process laboratories and supervision of research, engineering, construction, etc.

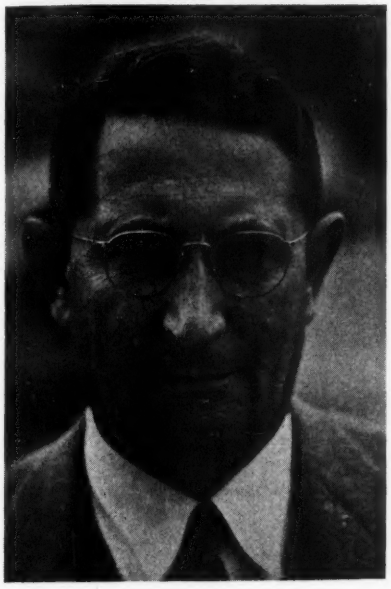
Mr. Dickey was graduated in 1904 from the University of Pennsylvania, with the degree of B. S. in M. E., and on graduation received the Sigma Xi honorary fraternity election. He also is a member of the American Society of Mechanical Engineers, American Petroleum Institute, Army Ordnance Association, Masonic Lodge, the California and Jonathan Clubs, and Newport Harbor and Catalina Island Yacht Clubs.

Previous to affiliation with General Petroleum, President Dickey experienced broad service in various engineering capacities, first during school years with Pennsylvania Railroad, Bell Telephone Company and University of Pennsylvania. For 8 years following his graduation he served as traveling plant efficiency engineer, superintendent of experimental development work, etc., for the United Gas Improvement Company of Philadelphia. In 1912 he was appointed engineer and superintendent of Syracuse Lighting Company, of Syracuse, N. Y. and while there directed design, installation and operation of a toluene plant to make toluene from manufactured gas for production of T.N.T.

Served War Department

After entry of the United States into the world war, Dickey was appointed by the Army Ordnance Explosive Division of the War Department to proceed to California to direct development of processes, design and installation of two major plants on the Pacific Coast to produce toluene for production of T. N. T. This work resulted in the first successful commercial scale production of nitration grade toluene direct

from petroleum, and solved an explosives shortage situation developing in this country at that time.



Fred Isaacs

Aside from research engineering, the hobbies of President Dickey include color photography, mountain stream fishing and sailing in his 50-foot ketch, in the design and construction of which he played a leading part.

New Board Members

Fred Isaacs, newly elected member of General Petroleum's Board of Directors, has been associated with the company since December, 1915, when he started as draftsman in the Vernon refinery, later becoming assistant superintendent of the synthetic plant, and superintendent of the Vernon refinery. When the Torrance refinery was constructed in 1929 he was made manager of refineries.

Lee Minckler

Robert Lee Minckler, the other new member of the Board, entered the service of General Petroleum in July, 1924, in the comptroller's department, after previous affiliations with the shipping industry of the Northwest. For several years he was director of the Kettleman-North Dome Association. He represented the California oil industry in Washington under the N.R.A. and has represented the oil industry of this state in various congressional hearings. He was made assistant to the president of General Petroleum on June 1, 1934.

A. C. Stewart Elected Union Vice President

Directors of Union Oil Company recently announced the appointment of A. C. Stewart as a director and vice-president in charge of sales, effective January 1, 1941.

Possessing an able background of sales experience, Stewart started his service with the Company while still in school. Prior to his graduation from Stanford University and the Harvard School of Business Administration, he spent his summer vacations familiarizing himself with the various phases of the Company's operations. During two summer vacations he shipped on the Company's tankers plying between California and Honolulu. Upon completing his college work, he became officially associated with the Company in 1928 as a service station employee. Later he became a salesman in the city of San Francisco, followed by his appointment to the position of Agent at San Jose. He later entered the Fuel Oil Department. In January, 1930, he joined the Export Sales Department, and in June of that year he began a tour of the Orient with other representatives of the Company to determine the extent of the market for petroleum products in the Far East. In 1931 Stewart was made Manager of Specialty Sales and in that capacity he was largely responsible for the development and promotion of Union's complete line of household and automotive specialties now being marketed throughout the Pacific Coast. Two years later he advanced to the position of Southern Division Sales Manager. In 1933 he became Assistant to the Director of Sales, receiving his appointment as Assistant Vice-President and Sales Manager in 1938.

A. C. Stewart

Simultaneously with Stewart's appointment, the Company announced the retirement of V. H. Kelly as a member of the Board and Vice-President in Charge of Sales.

Kelly began his association with Union Oil Company in Tacoma, Washington, as a salesman and through a series of promotions became Manager of the Northern Division. In 1929, he was transferred to Los Angeles where he assumed the Chairmanship of the Sales Committee. Retiring after thirty years of service with the Company, Kelly recently had one of the Company's new tankships named in his honor.

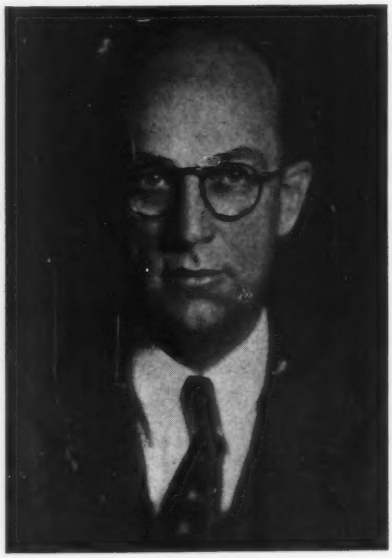
Gasoline Sale Curbs Are Declared Invalid

A provision of the Massachusetts motor fuel sales act of 1938, which denied gasoline station owners the right to issue trading stamps, premiums, and rebates to motorists, has been declared unconstitutional by the Massachusetts supreme court. Another provision of the same act was invalidated, the provision which prohibits changing the price of gasoline for at least 24 hours after it has been posted on the pump. "The opinions of this court lead to the conclusion that to attempt to forbid the use of trading stamps generally as merchandising practice is a violation of our constitution, and one question is whether their use in an otherwise legal transaction may be forbidden in connection with the sale of gasoline," the court said.

T. H. Beament Elected President Republic Supply Co. of California

Reorganization of the executive personnel of Republic Supply Co. of California following an important transaction with Youngstown Steel Products Co., is among the first major developments for the oil industry in California in 1941. With its sale of its Oil Country Tubular Department, including the Wilmington pipeyard, to Youngstown, Republic announces the resignation of J. A. Crawford, J. W. Schmid, and L. B. Wiggins, former officers and directors, who with R. I. Whelan and G. E. Pitts, join the Youngstown company.

T. H. Beament, who started with Republic Supply Co. in 1920, becomes president of the company, advancing from the position of executive vice president. Mr. Beament has been assistant secretary, treasurer, director, and vice president, progressively. He is a native Californian and saw service overseas during the World War.



T. H. Beament

Walter L. Duhig

W. L. Duhig, vice president in charge of sales, entered the oil business as a clerk with the old Pacific Oil Co. at Maricopa in 1920, later joining its affiliate, the Associated Supply Co. He became a member of the Republic organization in 1928 when that company purchased Associated Supply.

Mr. Duhig has held the positions of branch manager, manager of stores, director and vice president.

A. G. Fraser is manager of Republic's Machinery Department and is a director. He started with Republic in 1927 in its Mechanical Division, and has held successively positions of Sales and Service representative, assistant manager, and manager of Republic's Machinery Department.

John J. Pike becomes manager of purchases and stores. Upon graduation from Stanford in 1933, Mr. Pike started with Republic in the warehouse. Following that he worked in the company's field stores before entering the purchasing department. A year ago he was made manager of the purchasing department

John J. Pike

A. B. Ripley

A. G. Fraser

and a director of the company.

A. B. Ripley, who has been made treasurer of the company, is another Republic man who has risen rapidly. From Stanford in 1933 he started at the bottom of the ladder as one of Republic's office boys. After some experience in warehouse and field work, Mr. Ripley entered the credit department, and later was made manager of the department. He is now a director as well as treasurer of the company.

Republic Supply Co. was incorporated in 1917, being an outgrowth of the Tay-Pike Co. which Percy M. Pike and others formed in Coalinga in 1910.

Republic has prospered through the years and is now one of the major supply houses serving the California petroleum industry. In addition to its large and modern executive offices at 2122 East 7th St., Los Angeles, it maintains complete shop facilities for its machinery Department at 1753 Workman St. and stores at fifteen strategic points throughout California.

New A.I.M.E. Officers Hold First L. A. Meeting

With V. H. Wilhelm, assistant to production manager of The Texas Co. and newly-elected chairman, presiding, Leo Ranney described his method of horizontal drilling for oil and water to the American Institute of Mining and Metallurgical Engineers at its regular dinner meeting at the Los Angeles Athletic Club Jan. 10. The meeting was the first since the election of new officers last December.

With C. P. Watson, Seaboard Oil Co., and H. B. Menardi, mining engineer, as vice-chairman, committee chairmen as appointed by Mr. Wilhelm are: Leon W. Huebel, Arrangements; D. B. Myers, Membership; Thos. C. Bannon, Program; Prof. John F. Dodge, Preparedness; Thomas Clements, Student Prizes; Richard H. Pence, Publicity. Leon T. Huebel is chairman of the Juniors, and Lyle Smith is chairman of the Coastal Division.

Mr. Ranney's method of mining for oil, which in general consists of drilling laterally along the sand either from a chamber at the bottom of a shaft or from an outcrop if one exists, was first put into operation in Ohio, where he is vice-chairman of the Ohio Industrial Water Commission. This well was drilled from an outcrop into an almost completely drained sand, and has been a commercial producer since, even though other wells on the property had been abandoned as non-commercial.

According to Mr. Wilhelm, the subject of mining for oil is of considerable interest at this time, when adequate oil supplies are of great importance from the national defense viewpoint, since any method of recovering greater percentages of oil from oil-bearing formations gives further assurance that the United States will never fall short in supplies.

G. E. Kennedy Retires After 41 Years With Standard

After forty-one years of service with the Standard Oil Co. of California, George E. Kennedy, a member of the board of

G. E. Kennedy

directors since 1931, has made request for retirement which the board of directors has regretfully granted.

Mr. Kennedy became associated with the company in the sales department in 1899. In various sales capacities he served in Oakland, Fresno, Seattle and San Francisco. He became assistant to the general sales manager in the home office in San Francisco in 1926. In 1928 he became chairman of the sales committee and in 1930 was made general sales manager. He was elected to the board in 1931.

Wool, silk, and mohair can be sterilized and disinfected with Stoddard solvent by a method patented recently.

Screen ear muffs keep sound in, sparks out, of welders' ears.

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•

PREHEATS boiler feed water without use of any auxiliary equipment and with minimum piping. SAVE UP TO 1/6

In operation, this new feedwater heater will save approximately 1% of fuel for each 11° F. that feedwater is raised in temperature. And this saving is effected at virtually no cost, for it is accomplished by using heat that would otherwise go to waste—the exhaust of engine, pump or auxiliary turbines under pressure. The Feedwater Heater is a relatively simple piece of equipment, consisting essentially of a steel tube 14 ft. long with an O.D. of 14", in which is housed 4 pass, ¾" O.D. x No. 16 Admiralty Metal tubes, rolled and expanded into steel tube sheets.

YOU CAN MEASURE THE SAVINGS. Write for new Bulletin. It not only contains a chart from which you can tabulate the actual fuel savings at your plant, but also gives complete engineering description.

NATURAL GAS EQUIPMENT Inc.

539 Petroleum Bldg., Los Angeles, Calif.

Bakersfield • Hanford

San Francisco, Calif. • Houston, Texas

A BOILER SAVER

•

A FUEL SAVER

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WRITE FOR NEW BULLETIN

Geoaid's E. A. Hulbert States Case For Malibu Wildcat on Point Dume

So much has been said and written regarding the formations encountered in the wildcat located at Point Dume on the Malibu coast that California Oil World believes the following letter from E. A. Hulbert, manager of Geoaid, will be of interest to a great many oil men.

"Gentlemen:

"So much misinformation has been published about Malibu Well No. 1 being drilled by Sovereign Oil Co., that Geoaid feels called upon to state facts. Some of the errors were doubtless attributable to the Log of the Well prematurely filed by the Petroleum Engineer in charge of operations under the original setup. This log was based on eight short cores totaling 33 ft. of hard material out of 3469 ft. of hole. However, the published statement in one paper that the hole bottomed in solid basalt is not even borne out by that log. The abandonment notice was never authorized or justified and has been corrected.

"The drill records show that the rock bits used averaged 120 ft. of hole each and several were discarded because bearings wore out before bits were dull. An average drilling speed of 5 ft. per hour was maintained in spite of 12 twist-offs and one 5-day fishing job. Only hard material was cored. The softer materials were neglected so the exact nature of the formations encountered had to be obtained from drill records and core and sludge analysis. Some of the interested parties to the test represented by Geoaid do not think the log filed represents the true condition and it certainly does not correlate with the Boggs well or the Geology. For those reasons the well is to be deepened first to the sand found in the Boggs Well 500 ft. to the south and 200 ft. higher up on the north flank of the anticline. This Boggs sand was over 100 ft. thick and was considered by many at the time to be a commercial zone and was encountered at 3820 ft. with a good cap rock of hard dense shale. The casing should have been cemented in this shale but instead was cemented at the top of the whole saturated area at 3172 ft. The sands lying between were alternations of oil and water sands and shales so no oil was ever produced.

"The Boggs well encountered an overthrust fault with about 60 ft. of displacement thereon dipping to the northeast 70 dgr. The well entered the fault zone at 424 ft., passed through a heavily pyritized and altered zone of crushed and replaced metamorphosed Modelo and Topanga sedimentaries, passing through it into normal Topanga shales and sands at 1700 ft. In Malibu Well No. 1 the drill passed through the unconformity between Modelo and Topanga at about 1150 ft., entered the fault zone at 1188 ft. and passed through the same metamorphosed mineralized area found in the Boggs well, passing out of it at 2700 ft. The zone below that has not fully recovered from metamorphosis, thin ribs of metamorphosed black shale being encountered, but several beds have been picked up that seem to correlate with Boggs well. The last core was taken at 3402 ft. to 3411 ft. showing hard black shale similar to that exposed in Topanga formation in Sequit Canyon. Below this hard streak the drill passed through 57 ft. of sands and shales to its present bottom, but these formations were not included in the core analysis as shown by the log filed with the notice of abandonment.

"The zone of minor saturation was encountered in the Boggs Well at 3246 ft. alternating with water sands to 3764 ft. When Malibu Well No. 1 was started Geoaid asked to have the interval from 3446 to 4125 ft. cored to check accuracy of Boggs log. We knew the fault zone was there and no showings of oil or gas had occurred in that well to 3246 ft. but all of the cores taken in Malibu No. 1 were taken above the area we asked to have cored. While we were interested in the shallow sand it was only for correlation, for Geoaid's objective is a profound sand in the transition zone between Lower Topanga and Vaqueros, both favorable reservoirs for oil, and which have been undisturbed by volcanic action or dynamics as exposed in the overthrust blocks to the north and hence are believed to lie undisturbed under the Modelo in this area. Allowing for normal thicknesses of beds this reservoir should lie at from 6500 to 7500 ft. in depth. If the next thousand feet of hole brings out proper correlations with the Boggs well the Malibu No. 1 will be deepened to test this deeper zone. The structure contemplated is in direct line with the major coastal folding that has produced producing fields in Los Angeles Basin and Coastal fields.

"An extensive survey of the Rancho Malibu and regional geology was made by E. D. Foster, Geoaid's engineer in 1924-25, assisted by distinguished geologists and engineers including Dr. David T. Day, Frank Van Horn, Byron M. Johnson, Harold J. Clark, and Sam P. Cathro, resident engineer, together with experts on all phases of the mineralization and lithology. The position of the Topanga, Vaqueros and Modelo were very carefully determined together with the igneous and dynamic action that had occurred in the area. The data collected by these men was afterward corroborated by paleontological work on Miocene fossils by W. H. Corey in his post graduate work at University of California in 1928. In his preface and at page 171 of "Geology of Central Santa Monica Mountains," E. K. Soper of University of California at Los Angeles indicates the possibility of a structure south of the Malibu Coast Fault, which we had observed in original survey and which our very careful magnetic survey corroborated.

"It is a well known fact that much igneous and metamorphic action took place in the Topanga, mostly flat tongues and flows from the basaltic core of the Santa Monica Mountains 8 miles to the north, exposed with a width of more than 2 miles. Expressions of this magma are found in the contact fault zones overthrusting Topanga and Vaqueros blocks over younger rocks clear to the Malibu Fault, but the action gradually dies out until south of the Malibu Coast Fault the Modelo lies at a lower point than exposed rocks of older age and appears to be undisturbed except by one slight overthrust fault zone (through which both wells have drilled) but which has not displaced the Modelo more than 60 ft. A few spires of breccia and metamorphic replacements in fault zone are only evidences of invasion and these exist mostly in Topanga, a thin zone under the Modelo. The most prominent one is the Point Dume outcrop. To recognize the presence of basement rocks or Franciscan Rocks immediately underneath the Modelo as the published log indicates would assume an overlap of Modelo, Topanga and Vaqueros and possibly Sespe and Tejon all of which have been found faulted up in mountains to north, of three times the greatest relief of the Santa Monica Mountains, and this in face of the fact that this area is lower than any surrounding formations all of which are older than the Modelo.

"Our clients feel that the area has not been fairly tested by this hole to the 3469 ft. level so are determined to check correlation with Boggs well and to explore the overlap theory advanced to explain the hard material cored in this well. Our findings indicate the presence of Topanga, slightly invaded and partially metamorphosed by thermal solutions underlying the Modelo, and below that the favorable reservoir sands of the Lower Topanga-Vaqueros series undisturbed by igneous or dynamic action but containing a competent structure which the Malibu Well No. 1 is designed to explore. Regional and historic geology both show that marine beds exist below the Vaqueros and the presence of oil in the Mo-

delo indicate proper distillation of these beds to feed the reservoirs indicated and that no ingneous action sufficient to distill the Modelo shales has occurred.

"If you have been an inadvertent party to these publications about the Malibu Well No. 1 we would appreciate it if you would correct them. We stand ready at all times to furnish full and impartial facts in relation to this test.

"From now on the operation of Malibu Well No. 1 will be under the direction of E. D. Foster, engineer for Geoaid.

Respectfully,

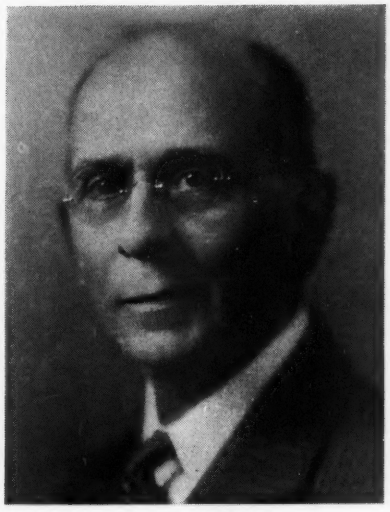
(Signed) GEOAID,

By E. A. Hulbert, Manager."

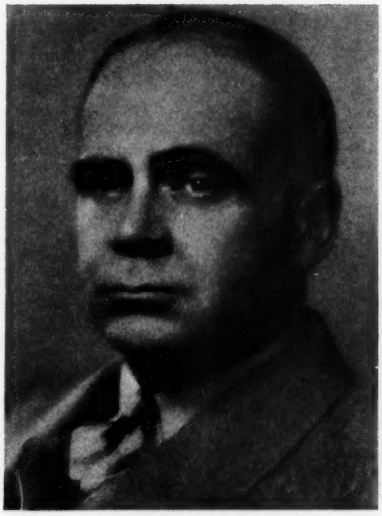
California Oil and Gas Association Elects Officers, Directors, for 1941

R. E. Collom, vice-president of the Continental Oil Co., was reelected president of the California Oil and Gas Association at the December meeting of the Association board of directors. Torrey H. Webb, vice-president of The Texas Co., and William Reinhardt, vice-president of the Union Pacific Railroad Co., were reelected vice-presidents. H. L. Westbrook, vice-president of the Belridge Oil Co., was reelected treasurer for his 16th successive term. F. E. Foster continues as managing director, and D. S. Kilgour continues as assistant manager.

R. E. Collom



H. L. Westbrook



Torrey H. Webb

Col. F. E. Foster

Directors elected for 1941 include: S. Belither, vice-chairman, Shell Oil Co., Inc., H. D. Collier, president, Standard Oil Co. of Calif.; R. A. Broomfield, exec. vice-pres., Barnsdall Oil Co.; D. S. Faulkner, vice-president, National Supply Co.; J. A. Crawford, president, Republic Supply Co.; C. R. Gallagher, president, Western States Gasoline Co.; E. B. Gilmore, president, Gilmore Oil Co.; Dana Hogan, president, Hogan Petroleum Co.; C. A. Johnson, president, Holly Oil Co.; C. S. Jones, president, Richfield Oil Corp.; W. M. Keck, president, Superior Oil Co.; R. B. Lloyd, president, Lloyd Corp.; John McFayden, vice-president, Ohio Oil Co.; Alexander B. Macbeth (retired); A. C. Mattei, president, Honolulu Oil Corp.; F. S. Wade, president, Southern California Gas Co.; F. C. Ripley, manager, Chanslor-Canfield Midway Oil Co.; L. P. St. Clair, Oil Administrator; C. P. Watson, vice-president, Seaboard Oil Co. of Del.; A. L. Weil, president, General Petroleum Corp. of California; R. P. Huggins, gen, mgr., Western Gulf Oil Co.; Lawrence Vander Leck, vice-pres., Fullerton Oil Co.; Leigh M. Battson; Joseph Jensen, incumbent president of the Wildcat Committee of the Association.

William Reinhardt

New British underground oil refinery will turn out some 30,000 bbls. of petroleum products daily, including enough aviation gasoline to meet one-fourth of Britain's anticipated wartime requirements.

New academic courses in "mineral dressing" deal with the chemical and mechanical treatment of coal, phosphate and iron, also include the refining of petroleum.

Production « « » » Development

(Figures of Production and Stocks are in barrels of 42 Gals.)

	Total Production November	—DAILY AVERAGE— Nov., 1940	Oct., 1940	Nov., 1939
Group No. 1				
Arvin	36,753	1,225	1,261	2,543
Belridge—North	295,103	9,837	10,028	11,819
Belridge—South	63,198	2,107	2,155	1,140
Canal	155,604	5,189	5,221	5,614
Canfield Ranch	1,153	38	39	75
Coalinga	946,816	31,561	29,882	19,366
Cole's Levee	125,134	4,171	3,638	1,789
Edison	89,930	2,998	2,223	2,309
Elk Hills	364,713	12,157	12,055	11,351
Fruitvale	161,566	5,385	5,358	6,072
Greeley	140,117	4,671	4,404	2,786
Kern River	322,777	10,759	10,601	11,695
Kettleman North Dome	1,169,766	38,992	42,840	51,056
Lost Hills	101,994	3,400	3,534	3,420
McKittrick	105,273	3,509	3,708	3,573
Midway-Sunset	1,423,608	47,453	47,391	49,472
Mountain View	184,466	6,149	6,105	7,359
Mount Poso	264,970	8 832	8,882	10,491
Paloma	19,194	640	459	191
Rio Bravo	301,143	10,038	11,007	7,918
Round Mountain	225,616	7,521	7,390	8,350
Strand	41,958	1,398	1,366	1,067
Ten Section	330,859	11,028	10,564	8,797
Tupman	203,902	6,796	6,666	699
Wasco	55,308	1,844	1,748	1,271
Wheeler Ridge	9,010	300	311	330
Group No. 2				
Capitan	50,949	1,698	1,579	2,159
Elwood	97,085	3,236	3,234	3,970
Rincon	149,202	4,973	4,941	3,738
San Miguelito	100,781	3,359	3,242	2,876
Santa Barbara	6,445	215	222	342
Santa Maria	206,872	6,896	7,191	5,788
Santa Maria Valley	572,912	19,097	20,054	10,435
Summerland	511	17	23	34
Ventura Avenue	1,009,470	33,649	33,848	36,456
Ventura-Newhall	280,137	9,338	8,090	7,071
Watsonville	750	25	25	30
Group No. 3				
Brea-Olinda	165,994	5,533	5,488	5,697
Coyote—East	122,173	4,072	3,809	2,912
Coyote—West	265,140	8,838	8,125	7,737
Domingues	653,848	21,795	21,839	18,811
El Segundo	54,313	1,810	1,793	2,892
Huntington Beach	768,198	25,607	25,845	27,156
Inglewood	334,182	11,139	11,134	13,085
Lawndale	951	32	43	47
Long Beach	1,268,485	42,283	42,991	44,361
Los Angeles-Salt Lake	15,588	520	545	550
Montebello	492,562	16,419	16,795	27,411
Playa Del Rey	119,550	3,985	3,858	4,515
Potrero	65,731	2,191	2,193	1,379
Richfield	222,976	7,432	8,941	8,506
Rosecrans	396,093	13,203	13,286	10,490
Santa Fe Springs	759,726	25,324	25,472	26,581
Seal Beach	198,528	6,618	6,591	7,009
Torrance	291,831	9,728	9,838	13,837
Whittier	5,540	185	193	931
Wilmington	2,414,350	80,478	80,842	85,383
Total	18,230,804	607,693	610,906	612,742
October	18,938,092	610,906		
Decrease	707,288	3,213		

	New Rigs Up	Active Drilling	Producers Completed	Daily Initial Output	Active Producing	Abandoned Wells Drillers	Abandoned Wells Producers
Group No. 1							
Arvin	..	....	....	....	15	....	....
Belridge—North	..	4	....	....	71	....	....
Belridge—South	..	....	....	....	189	....	....
Canal	..	1	....	....	34	....	....
Canfield Ranch	..	....	....	....	1	....	....
Coalinga	7	22	3	4,009	906	1	2
Cole's Levee	1	6	4	3,314	31	....	....
Edison	..	....	1	200	96	....	....
Elk Hills	1	....	....	....	196	....	....
Fruitvale	..	....	....	....	170	....	....
Greeley	4	6	3	4,105	37	....	....
Kern River	3	3	....	....	1,548	....	....
Kettleman No. Dome	1	9	....	....	265	1	....
Lost Hills	..	....	....	....	264	1	....
McKittrick	..	1	....	....	201	....	....
Midway-Sunset	2	4	2	175	2,503	....	2
Mountain View	..	....	....	....	176	....	1
Mount Poso	1	....	1	70	284	....	....
Paloma	1	2	1	960	5	....	....
Rio Bravo	3	5	1	2,006	69	1	....
Round Mountain	..	....	1	25	225	1	....
Strand	..	....	....	....	8	....	....
Ten Section	3	4	4	6,959	67	....	....
Tupman	2	10	3	5,715	39	....	....
Wasco	..	2	....	....	12	....	....
Wheeler Ridge	..	1	....	....	34	....	....
Group No. 2							
Capitan	..	....	....	....	44	....	1
Elwood	..	....	....	....	74	....	....
Rincon	2	2	1	311	68	....	....
San Miguelito	2	3	2	2,072	26	....	....
Santa Barbara	..	1	....	....	19	....	....
Santa Maria	1	....	1	899	181	....	....
Santa Maria Valley	3	2	2	276	141	....	....
Summerland	..	....	....	....	8	....	....
Ventura Avenue	1	10	1	1,328	322	....	....
Ventura-Newhall	..	13	3	1,256	519	....	....
Watsonville	..	....	....	....	7	....	....
Group No. 3							
Brea-Olinda	..	....	1	306	362	....	....
Coyote—East	..	2	1	50	87	....	....
Coyote—West	..	....	....	....	78	....	....
Domingues	2	5	1	586	200	....	....
El Segundo	..	....	....	....	39	....	2
Huntington Beach	5	4	5	3,541	547	....	2
Inglewood	1	3	....	....	198	....	....
Lawndale	..	....	....	....	5	....	....
Long Beach	2	4	2	175	1,216	....	....
Los Angeles-Salt Lake	..	....	....	....	103	....	....
Montebello	..	1	....	....	335	....	....
Playa Del Rey	..	....	....	....	146	....	4
Potrero	..	2	....	....	19	....	....
Richfield	..	....	....	....	298	....	....
Rosecrans	4	7	3	1,610	170	....	....
Santa Fe Springs	..	....	....	....	582	....	....
Seal Beach	..	....	1	169	120	....	....
Torrance	..	....	....	....	633	....	10
Whittier	..	....	....	....	38	....	....
Wilmington	12	11	10	3,483	899	....	....
Miscellaneous Drilling	9	29	....	....	....	6	....
Group No. 4—Gas Fields							
Buena Vista Lake	..	....	....	....	3	....	....
Buttonwillow	..	....	....	....	19	....	....
Chowchilla	..	....	....	....	....	....	....
Delano	1	1	1	Gas	17	....	....
Fairfield Knolls	..	....	....	....	....	....	....
Goleta	..	....	....	....	....	....	....
Marysville Buttes	..	....	....	....	3	....	....
McDonald Island	..	....	....	....	5	....	....
Rio Vista	..	....	....	....	23	....	....
Semi-Tropic	..	....	....	....	1	....	....
Tracy	..	....	....	....	4	....	....
November	74	180	59	43,600	15,005	11	24
October	84	177	78	79,853	15,015	9	47
Decrease (*Increase)	10	3*	19	36,253	10	2*	23

SUMMARY OF CALIFORNIA OILFIELD OPERATIONS FOR NOVEMBER, 1940—STOCKS HELD IN PACIFIC COAST TERRITORY BY CALIFORNIA OIL COMPANIES

	Nov. 30, 1940	Oct. 31, 1940	November Changes	Nov. 30, 1939
1 Gasoline-Bearing Crude	35,040,846	35,292,981	− 252,135	35,011,252
2. Non-Gasoline-Bearing Crude	12,238,745	12,351,317	− 112,572	13,654,537
3. Unblended Nat. Gas	2,548,369	2,619,397	− 71,028	1,652,947
4. Gasoline (not including distributing and service stations)	14,619,376	14,274,663	+ 344,713	15,011,338
5. Naphtha Distillates	1,794,281[1]	1,766,386[1]	+ 27,895	1,283,727[1]
6. Gas Oil and Diesel Oil	10,142,821	10,621,124	− 478,303	9,880,120
7. Fuel Oil Residuum	60,903,241	61,777,967	− 874,726	67,437,999
8. All Other Stocks	8,501,975[2]	8,738,807[2]	− 236,832	7,944,532[2]
TOTAL	145,789,654	147,442,642	−1,652,988	151,876,452
[1]Estimated amount of unfinished gasoline in item 5	1,654,924	1,585,704		1,054,145
[2]Coke included in item 8	971,106	1,035,784		859,288

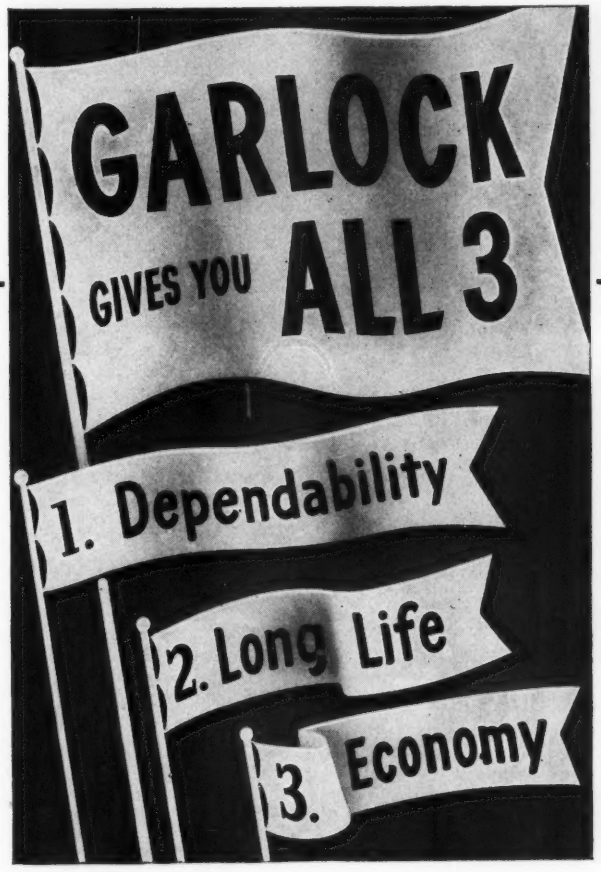
First Annual Golf Tournament Held by Nomads in Los Angeles

The first annual golf tournament of the Los Angeles Chapter of Nomads was held at the California Country Club during the morning and afternoon of Dec. 27. Nomads and their guests there competed for prizes which were awarded at the regular monthly dinner which followed the tournament, among the guests being a number of men from foreign fields who are visiting the United States either on business or vacation. The contest was separated into two groups, one for guests and the other for regular and associate Nomad members. The results were as follows:

Nomads' guests: Low gross, C. V. Harlow; first low net, Frank Bergeron of Baash-Ross Tool Company; second low net, Lee Laird of Chiksan Tool Company; third low net, D. Bradburry of Howard Supply Company; fourth low net, A. B. Jenks of Fullerton Oil Company; fifth low net, Eddy Ross of Baash-Ross Tool Company; sixth low net, W. H. Pierce of Petroleum Securities Company; and high gross, C. D. Hendershott of N.P.P.M. from Sumatra. Door prize, John Augsburger, of Arthur N. Macrate Oil Company.

Nomads: Low gross, Morris Smith of E. M. Smith Company; first low net, George Trembley of Howard Supply Company; second low net, George Anderson of Baker Oil Tools, Inc.; third low net, G. W. Moore of The Cavins Company; fourth low net, E. B. Fowks of Emsco Derrick and Equipment Company; fifth low net, F. B. Knox of Baker Oil Tools, Inc.; sixth low net, K. R. Catchpole of D. & M. Machine Works; and high gross, Tut Lee of Regan Forge and Engineering Company. Door prize, Shorty Hamer of Hamer Oil Tool Company.

After the dinner the subject of golf was carried further with the showing of talking pictures depicting the fundamental principles of the game. Foreign visitors who remained for the dinner and evening session included R. P. Borncamp of Trinidad Leaseholds, Ltd.; H. O. Higgins of the Asiatic from Papua; Charles Hauenstein of Iraq Petroleum Corp.; C. D. Hendershott of the N.P.P.M. from Sumatra; M. H. Bush of Bahrein Petroleum Co.; D. T. O'Connor of Bahrein Petroleum Co.; Harvey Lytel of Soc. Vac. recently from Egypt; C. L. Clark of Soc. Vac. de Colombia; J. A. Castro of Y.P.F. from Argentina; J. A. van Rassell of B.P.M.; and J. W. Cunes of B.P.M.

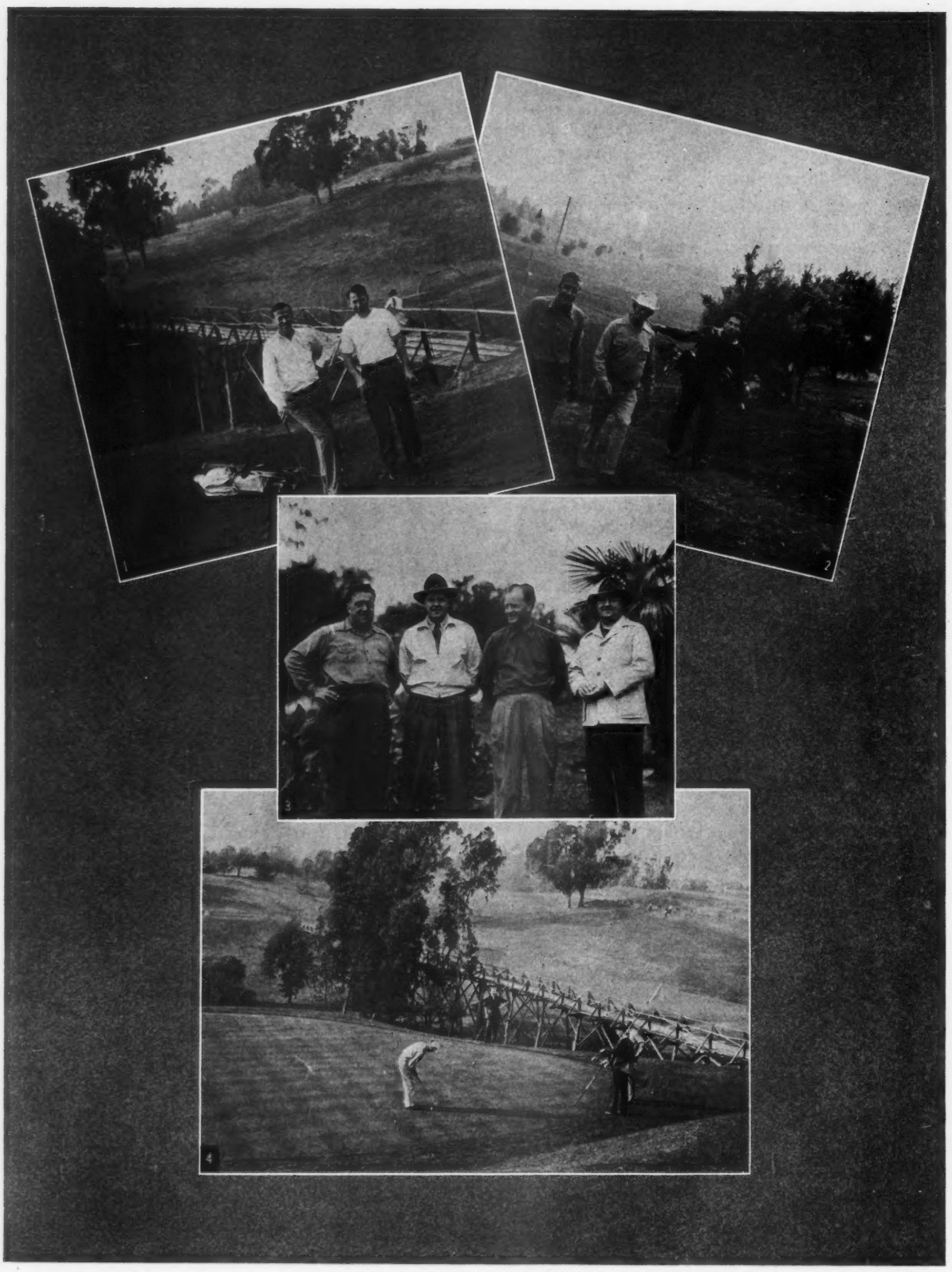


These three qualities are essential for superior packing performance: 1. *Dependability* even under the most severe service conditions; 2. *Long Life* that prevents frequent shutdowns for repacking; 3. *Economy* that keeps down maintenance costs. Garlock gives you *all three.* For outstanding service, standardize on GARLOCK—the standard packing of the world.

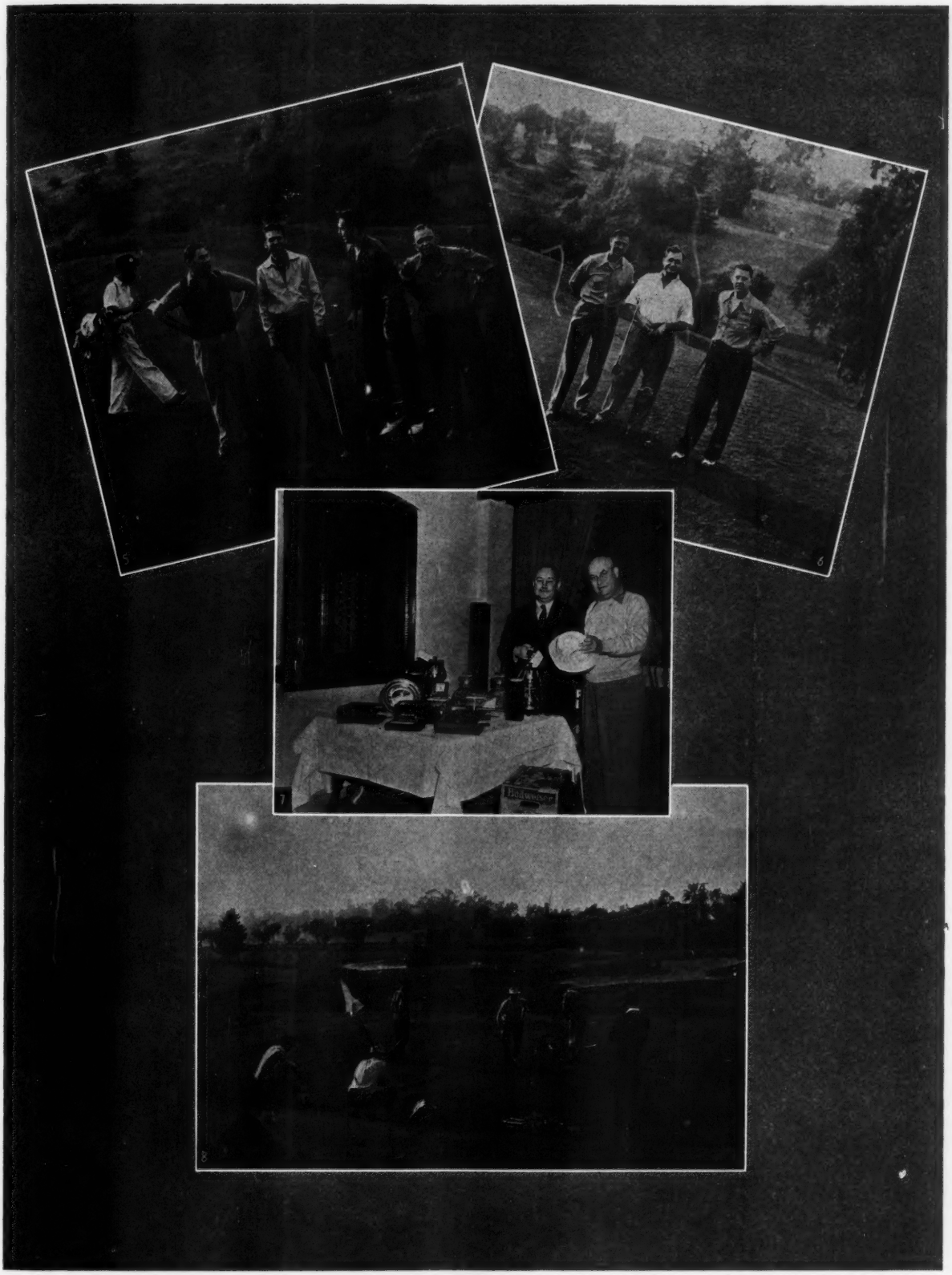
THE GARLOCK PACKING COMPANY

Palmyra, New York

Tulsa, Okla. Houston, Tex. Los Angeles, Calif.



NOMADS 1. Waldo Moore, Cavins Co.; C. V. Harlow, operator. 2. George Trembley, Howard Supply Co., Harold S. Pierce, Bob Lytle, Inc. 3. Jack Wilcox, S. R. Bowen Co.; Morris Smith, E. M. Smith Co.; C. D. Hendershott, N. P. P. M., Sumatra; Walter Smith, E. M. Smith Co. 4. The scenery left nothing to be desired.



GOLF 5. Bill Higgins, Asiatic Petroleum; Lou Bronzan, Baash-Ross; Tom Murphy, Martin-Decker; Jay Curts, Gulf Publishing Co. 6. Keith Catchpole, D & M Machine Works; Harvey Lytle, Socony-Vacuum; Bill Kinder, D & B Pump. 7. Looking over the awards are Ted Sutter, Baker Oil Tool, Nomad president, and E. B. Fowks, Emsco Derrick & Equipment.

THIS LAUGH OFF!!

At the Nomads' big golf tournament we overheard **Ted Sutter** tell this instructive tale: "See here," says the captain, "this thing is a rifle. Here is the barrel, there's the stock. You slip the cartridge in there. Now you put the weapon to your shoulder. Those little things on the barrel are the sights. When you have taken accurate aim, pull this little thing which is the trigger. Now remember what I have told you. Smarten up and look like a soldier. By the way, what is your business? A clerk, I suppose?"

"No, sir, I'm a gunsmith."

And when **Frank Champion** asked who was the man at the bar snapping his fingers so feverishly, **Geo. Ratcliffe** opined that it was a deaf mute with the hic-cups.

Dick Anderson tells of two producers who passed the theater as one of those pulchritudinous ravishing Follies beauties stepped out. "I feel like taking her out again," whispered one.

"Have you had her out?"

"No, but once before I felt like it."

"What's your name?" the equipment store manager asked the young applicant for a job recently.

"Wells," replied the lad.

"And your first name?"

"Lane."

"Lane Wells, eh?" remarked the manager with a smile. "That's a pretty well known name."

The boy looked pleased. "Yes, sir, it ought to be, I've been strapping tanks around here for **two years now."**

"Deck" Decker told this one to a group of fellow Nomads. A man and his wife were suffering from seasickness, while their young son became more rowdy by the minute. Finally, the mother mustered courage and voice enough to say:

"John, I wish you would speak to Willie."

The father, unable to lift his head, said feebly: "Hello, Willie."

A tool pusher and a driller went hunting, **Charley Chandler** recalls, and the toolie managed to bag a couple of birds. He retrieved them and started crowing to the disgruntled grief stem artist. "How did ya like that?" he chortled.

"You wasted a shell," the driller retorted. "The fall was enough to kill them!"

And, there must be some kind of moral in the story **Bud Broomfield** tells:

The drunk hailed a cab and fell into the back seat.

"Shay driver," he ordered, "drive me aroun' the block a hundred timesh."

The driver was startled—but he obliged just the same. And around and around the block they went. And on the sixty-fifth trip, the stew leaned over to the driver.

"Step on it, buddy," he hiccoughed. "I'm in a hurry."

The subject was chirography, and **Dick Brown** contributed this gem:

An invitation to dinner had been sent to the newly settled physician. In reply, the hostess received an absolutely illegible letter.

"If I were you," suggested her husband, "I should take it to the druggist. Druggists can always read the doctors' letters, however badly they are written."

The druggist looked at the slip of notepaper, went into his dispensary, and returned a few minutes later with a bottle, which he handed over the counter.

"There you are, madam," he said. "That will be 75 cents."

"You mean, Liza, your husband got concussion of the brain in the accident, not conclusion of the brain," **Bob Gilbert** explained.

"No suh. Ah means conclusion of de brain. He's daid," Liza insisted.

The talk was of the growing number of specialists that have come into the petroleum engineering picture. **John Woodward** was reminded of this story:

"I suppose you are going to be a specialist, like so many of the young men nowadays?"

"Yes, doctor. I am going to specialize in diseases of the nose."

"Indeed! which nostril?"

The talk got around to literature at the last C.N.G.A. meeting, and **Walt Dayhuff** recounted an example of practical application:

"Daddy is so pleased to hear that you are a poet."

"Fine. He like poetry then?"

"Not at all. But the last boy friend of mine he tried to throw out was an amateur boxer."

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Field Development

Los Angeles Basin

Upper Del Valle Zone Proves Highly Prolific

The Upper Del Valle zone, untested by R. E. Havenstrite, Operator's Lincoln No. 1, was proved to be highly prolific in the completion of Lincoln No. 2 at a 3300 bbl. daily rate. The second well encountered the horizon at approximately the same structural position as the first which was carried on to discover and complete in the Second and Third sand intervals.

The Upper or First Zone was not cored in No. 1 but showed up so well on the electric log that it was decided to core and test it in the second well which found the horizon even better than expected. Casing was cemented at 6037 ft. and after a formation test indicated production was a certainty, the hole was cored to 6221 ft. where a perforated liner was landed. Completed Dec. 31, initial production was at the rate of 3300 bbls. a day of 36 gravity oil through a 48/64 in. bean and, unlike the first completion of No. 1, the gas-oil ratio was very good. With the bean reduced to 16/64 in., production is 560 bbls. of clean oil and 425,000 cu. ft. of gas, the pressures standing at 850 lbs. on the tubing and 1275 lbs. on the casing.

Definite proof of the productivity of the new zone is expected to accelerate development of the area; Universal Consolidated Oil Co. already having made a location for a well while the Havenstrite organization plans to run two strings continuously.

Silver Pet. Completes Wilmington Outpost Well

Another step toward completely linking the Torrance and Wilmington fields was made in the finishing of the Silver Petroleum Co. Well No. 1 at the intersection of Frigate and "Q" Sts. for 100 bbls. a day. It is the third well to prove the upper section of the Wilmington Terminal zone productive near the easterly limit of the Torrance Del Amo zone.

Silver Petroleum Co., headed by J. A. Smith of Barnhart-Morrow Consolidated, obtained a substantially larger yield than its predecessors in the area, Vesta Petroleum Co.'s No. 1 at the southwest corner of State and Figueroa Sts. and Richfield Oil Corp.'s Capitol No. 1 which

LOS ANGELES BASIN WILDCATS

Area	Well	No.	Section	Depth	Status
Athens	Rankin & Williams	1	7, 3-13	8251	Drilling
Castaic	Colter, R. T., Explor.	1	8, 4-17	1338	Cleaning out
	Havenstrite, R. E., Lincoln	2	16, 4-17	6221	Completed
	Havenstrite, R. E., Vasques	1	24, 4-17		Foundation
	Pedro Pet. Co., Oates	1	24, 5-17	2205	Idle
	Universal Cons. Oil Co., Dennis	1	21, 4-17		Grade
	Western Gulf Oil Co., Lechler	1	31, 5-17	2442	Testing
	Worland Oil Co., Jenkins-Owens	1	18, 5-16	2950	Fishing
Dominguez, West	Wood-Mellon Oil Co., Wood	1	31, 3-13	7498	Idle
Malibu	Sovereign Oil Corp., Sovereign-Marblehead	1	7, 2-18	3469	Idle–may deepen
Mint Canyon	Redwood Oil Co., Mitchell	2	22, 4-15	1580	Idle
Monterey Park	United Petroleum Co., Haig	1	26, 1-12	3671	Idle
Newhall	Canyon Oil Co., Sanborn	1	6, 3-16		Rig
	Creighton Hammon Synd., C. H.	1	17, 3-16	990	Idle
	Lee, Wm. Y., Irene	1	31, 4-15	300	Idle
Palos Verdes	Rolling Hills Pet.	1	27, 4-14	6580	Idle
Redondo	Calif. Oil & Ref. Co., Cal-o	1	18, 4-14		Location
Puente	The State Co., Rowland	1	14, 2-10		Rigging up
Torrance-Wilmington	Silver Pet. Co.	1	30, 4-13	3761	Pumping
San Fernando	Casa Grande Oil Co., Lopez-Lundy	1	1, 2-15	3785	Idle
West Whittier	Cal. Pico Oil Co., Beach	1	7, 2-11	7788	Idle
	Orange County				
Costa Mesa	Thompson, Milton N. Banning	1	9, 6-10	5649	Idle
	San Bernardino County				
Carbon Canyon	Earp, H. R., Kraemer-Backs	1	34, 2-8	1352	Idle
	May, Homer, Oasis	1	31, 2-8		Rig

NORTHERN COUNTIES WILDCATS

County	Well	No.	Section	Depth	Status
Humboldt	Daly, M. B. Jr.	1	2, 1n,2e	3204	Bldg. rig
Madera	Blake, T. N., Arnold	1	22, 10-17	3204	Pump. water
Merced	Don Pedro Oil Co.	1	9, 6s-9e	1906	Idle
Mendocino	Keyt, N. F.	1	3, 12n-17w		Location
Monterey	Loma Grande Oil Co., Corey	1	23, 24s-10e	2175	Idle
	Priest Valley Pet. Co.. Greve	1	22, 20s-12e	2885	Idle
Sacramento	Independent Exp. Co., Perry	1	19, 7n-6e	4808	Abandoned
San Joaquin	Standard Oil Co., Blewett	1	25, 3s-6e	3872	Completed
San Mateo	Ra-Lite Petroleum, Inc., Bell	5	16, 7s-4w	1200	Idle
Solano	Richfield Oil Corp., Potrero Hills	3	10, 4n-1w	3742	Drilling
Yolo	Standard Oil Co., Tippets	2–1	9, 12n-3w	3240	Idle
Yuba	Wright, L. G. Cox	1	18 14n-5e	1795	Idle

was plugged back from the Del Amo zone. Although Silver's output is not large, gravity of the oil is 19 degrees and the water content is said to be around 10.0%.

Mechanically the new well is completed with a single string of casing which contains pre-pack perforations and is landed on bottom at 3760 ft. Cement jobs were effected at 3560 ft. and near the surface.

Several other concerns are planning to drill wells on the strength of the Silver Petroleum well but none have actually started work.

Union Completes Coyote Outpost

Overcoming troublesome mechanical difficulties, Union Oil Co. completed its Toussau No. 2 as the most westerly producer in the newly developed deep zone of the East Coyote field. On the beam, capacity seems to be 125 to 150 bbls. a day net oil, the cut being approximately 25.0%.

Toussau No. 2, located several hundred feet west of the nearest deep well, found the stratigraphy somewhat different than the larger producers of Bartholomae Oil Corp. and Standard Oil Co. which topped the zone at higher levels. Drilled to 7775 ft., the hole was plugged to 7305 ft. where 5½-in. casing was landed and cemented through the top perforations at 6713 ft.

East of Brea Canyon Road, Bartholomae Oil Corp. is preparing to test casing in Stern No. 4, an old pumper deepened to 7105 ft. Standard Oil Co. is preparing to deepen Coyote No. 2-10 from 4800 ft.

In the old central portion of the field, Graham & Loftus Oil Co. recompleted No. 16 after redrilling and deepening a few feet to 3332. Production is 30 bbls. of 22 gravity oil cutting 60.0%.

Two projects are active in the Master section; Adco Petroleum Co. drilling at 1800 ft. and H. M. Tucker building a derrick for Wright No. 2.

California National Oil Co. suspended operations at 3400 ft. in its north flank well.

Exploration Planned For Los Angeles Basin

From all appearances, 1941 will be an active one in the Los Angeles Basin area from the standpoint of exploration. Several land plays are reported underway in both Los Angeles and Orange counties and drilling obligations in lease blocks taken last year are coming due so it is a good gamble that the next few weeks will see the start of one or more wildcats. A healthy sign that the exploratory program will be fruitful is seen in the fact that the areas now being considered for drilling are those generally recognized to offer a real chance for success. In other words, there is little evidence of the screwball element which is so often identified with independent wildcatting. Should the present trend toward legitimate exploration result in the drilling of a dozen or more wells, there is good reason to hope that at least one new field will be discovered in the Basin this year.

There is little of interest in the current crop of wildcats aside from The State Co.'s Rowland No. 1 east of Puente. Now preparing to spud in, the project is located approximately half a mile east of the group of wells drilled during the past ten years by Honolulu Oil Corp. and the late Chas. R. Butler. All wells drilled in this vicinity encountered showings and some produced small quantities of oil.

Other wildcats are all suspended with the exceptions of Rankin & Williams No. 1 on the Athens Golf Course and those in the Castaic area. Wood-Mellon Oil Co. obtained only a little oil in a pumping test of its West Dominguez well, Cal-

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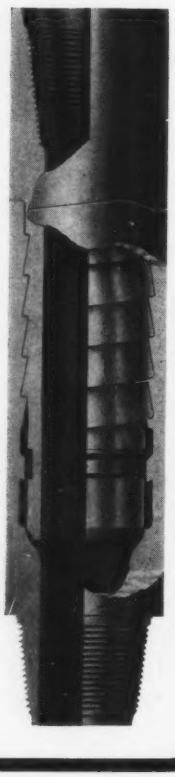

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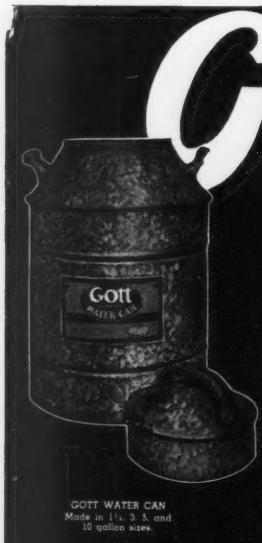

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Pico Oil Co.'s Beach No. 1 at Pico was dry on formation tests, United Petroleum Co. is reorganizing to continue work on Haig No. 1 at Monterey Park and Rolling Hills Oil Co. is idle after pumping water. On Point Dume, Sovereign Oil Corp. plans to resume work soon in Malibu No. 1, now suspended at 3469 ft.

Callender No. 79 Passes 12,000 Ft.

Deepest well ever drilled in the Los Angeles Basin is the greatest claim to fame so far for Union Oil Co.'s Callender No. 79, now drilling below 12,016 ft. at Dominguez. Formation data has been closely guarded by the company on this important deep test but it is believed that some sand was found between the 10,000 and 11,000 ft. levels which could be compared favorably with the deep zone at Long Beach. Unless better horizons are uncovered, the hole will eventually be plugged for a test of these showings.

Extending production to the west, Union Oil Co. brought in Austin No. 6 in the Seventh Callender interval 7025-7120 ft. flowing 320 bbls. of 32 gravity clean oil and 300,000 cu. ft. of gas. Location for No. 7 has been surveyed to the south and west.

R. E. Havenstrite, Operator, is below 6500 ft. in Larronde No. 6 and is preparing to redrill the very nearly barren No. 5 from 6800 ft.

Clear View Tests Five Points Well

Clear View Oil Co. is completing its Williams No. 2 in the Five Points area of Huntington Beach after bottoming at 4250 ft. and cementing casing at 4170 ft. The well is the first for this section in many months.

Signal Oil & Gas Co. completed three wells on the Bolsa property recently with yields ranging from 239 bbls. to 900 bbls. a day. The company is operating two strings of tools continuously.

On the ocean front, The Termo Co. and Southwest Exploration Co. finished tideland wells at 275 bbls. and 435 bbls. respectively.

Standard Oil Tests Inglewood Deep Zone

In order to determine as accurately as possible the potentialities of the Inglewood deep zone, Standard Oil Co. is making free use of the formation tester in L.A.I. No. 3-1. Several runs below 8600 ft. indicate the presence of gas but no great amount of oil has been recovered to present depth of 8922 ft.

At the north end of the field, R. R. Bush Oil Co. seems to have successfully sidetracked the fish in the Federal well and is preparing to start coring at 7865 ft. Rough correlations place this well higher than the Standard project and near the top of the objective horizon.

Completing L.A.I. No. 1-86 on gas-lift, Standard Oil Co. set a production rate of 1700 bbls. a day from the 4000 ft. zone in the central part of the field. Kettleman & Inglewood Corp.'s Rubel No. 27, finished at 3270 ft., flowed 900 bbls. a day. Standard is preparing to spud L.A.I. No. 1-85 which will be carried to one of the established shallow zones.

Production Test Planned For Dominguez Outpost

Of more than usual interest are the plans of the newly formed Hiles Drilling Co. to make a production test in the abandoned Pongratz Oil Co. Grant No. 1 west of present limits of Dominguez production. Drilled almost an even year ago, the well encountered streaks of oil sand from 7180 to 7250 ft. below which was gray sand to bottom at 7660 ft. No tests of any kind were made before abandoning. On the basis of tentative correlations, the Grant well appears to be only 160 ft. lower than Union Oil Co.'s Austin No. 6, the nearest producer 1400 ft. to the east, which was completed New Year's eve flowing 300 bbls. of 32 gravity clean oil through a 16/64 in. bean from 7025 to 7120 ft. A. E. (Eddie) Hiles, president of the new company, is well known in the industry having been associated with Otis Hoyt for many years.

Tests Indicate Castaic Discovery

Two formation tests in Western Gulf Oil Co.'s Lechler No. 1 in Oak Canyon indicate the discovery of a new shallow field in the Castaic area which returned to the limelight last summer with the completion of Havenstrite's Lincoln No. 1.

Located in sec. 31,5-17 about four miles northwest of Del Valle, the Lechler well cored Modelo oil sand from 2358 to 2378 ft. and streaks of fair sand to near bottom at 2442 ft. A formation test of the 20-ft. interval, open 30 minutes, recovered eight barrels of muddy oil so a second test was made with the hole open to 2403 ft. Open one hour, recovery was three barrels of mud, nine of oily mud, 14½ of 21.5 gravity oil and 3½ of fresh water. With a 16/64-in. bean at the surface, the gas blow was estimated at 100,000 cu. ft. daily rate.

Preparations are under way to set casing at 2290 ft., land a perforated liner and complete.

From studies of the "bugs" in the cores, the zone appears similar to the second horizon in the Del Valle field which is open in Lincoln No. 1, the upper Del Valle sands being absent at Oak Canyon. Top of the Miocene has not definitely been pegged but is probably near the 2000 ft. level.

Present plans call for completion of Lechler No. 1 and the immediate starting of another well to prospect for deeper sands. As the well was only 50 ft. higher than the old Marland well drilled nearby, it may be assumed that dips are flatter than expected an consequently the field will have a larger areal extent than anticipated.

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Union Drilling Deepest Hill Well

With the former Signal Hill record of 10,411 ft. already surpassed by more than 200 ft., Union Oil Co. is still coring ahead in L.B.C. No. 19 at Long Beach. Although no official expression has been made by the company, it is believed that drilling will be continued for some distance in search of sands more permeable than those open in the previous record holder, Dormax No. 1, across the street.

Sharing honors with L.B.C. No. 19 as the most important well in the Signal Hill field is Royalty Service Corp.'s I.C. No. 1 on California Ave., one block south of Wardlow Road. Located at the northeasterly limit of old production, this well will open a large new area if successful.

Oilfields Service Assn. Elects Governing Board

Culminating eight years of successful participation in the problems and needs of the California oil industry, the Oilfields Service Association elected a new Board of Governors at a regular meeting at the Virginia Country Club in Long Beach on January 9.

Under the gavel of retiring President Geo. A. Reeves of Graham Bros. Co., and the cooperative spirit of members and guests, routine business was quickly expedited. Many guests were introduced while Lee Blanchard of the Edison Co. and Don O'Donnell of O'Donnell Gravel Pack were welcomed as new members.

Dick Fenton of the California Stripper Well Association briefly outlined the purposes of his association and reported the tenor and results of present operations.

Following brief and amusing specialty entertainment, Mr. Garrick of the Dearborn Chemical Company presented for the first time, moving pictures of the inside workings of boilers actually operating under 275 lbs. pressure.

Through specially rigged sight glasses in the dome of a locomotive boiler a movie camera for the first time recorded the action of steam and water under standing and road conditions. The tremendous expense involved in such an innovation has already been justified through increased knowledge of steam boiler problems. Benefit has been gained through knowledge of the relationship of boiler water height to that in the outside glass, and the beginnings of a method to control foaming.

Board of Governor members including those elected to fill vacancies are: George Reeves, Graham Bros.; Hugh Harmon, American Boiler Works; Sol Alexander, Century Oil Co., Frank Halfen, Shull Perforating; Raphael Dechter, Attorney; R. C. Hopkins, Gold Seal Tank Co.; J. B. Nelson, J. B. Nelson Co.; A. C. Anderson, Public Accountant; Frank Vessels, Oil Field Construction Co.; Homer Dulin, Homer R. Dulin Co.; Lee Foust, Foust's Scouting Service, and L. S. Hamer, Hamer Oil Tool Co.

First action of the new board was a vote of appreciation to Mr. Reeves for his past work as executive officer and the elevation of R. C. Hopkins, past Vice President, to the office of President, the election of Hugh Harmon as Vice-President and the unanimous vote to retain H. O. Ziegler as Secretary-Treasurer.

South Basin Finishes Rosecrans Outpost Well

Extending Rosecrans production to the southwest corner of Redondo Blvd. and Main St., South Basin Oil Co. completed its Well No. 102 flowing 410 bbls. of 31 gravity clean oil from a total depth of 7986 ft. Half a block to the east, Royalty Service Corp. obtained about half that yield in its A-W No. 4 from a similar depth.

Rainbow Petroleum Co,'s Crawford No. 21 which staged a spectacular blowout last month proved disappointing on controlled production and is now making only about 80 bbls. a day and 600,000 cu. ft. of gas.

In the older section of the field north and west of Rosecrans Ave. and Figueroa St., Universal Consolidated Oil Co. is down about 8700 ft. in Trust No. 8 which is searching for deeper sands.

Midfield Oil Co.'s Murdoch No. 1, located north of Compton Blvd. and west of San Pedro St., deepened to 9486 ft. but seemingly found little encouragement except for a fair looking interval from 8800 to 8915 ft. which may later be tested.

St. Anthony Oil Corp., one of the most successful operators in the southerly section, is planning to continue its development program at least through the first half of 1941.

Pacific Pump Chief Made Dresser Director

A. R. Weis, president and general manager of the Pacific Pump Works, Los Angeles, Calif., has been elected to the board of directors of the Dresser Manufacturing Co., Bradford, Penna., according to an announcement made by H. N. Mallon, president.

Mr. Weis has been identified for many years with the development of heavy-duty centrifugal pumps for power plant and oil refineries. He became president of the Pacific Pump Works, a wholly owned subsidiary of Dresser Mfg. Co., October, 1940, after serving as vice president and chief engineer from the company's organization in 1924.

A. R. Weis, president, Pacific Pump Works, recently elected to the Board of Directors of the Dresser Mfg. Co.

Pacific Pump Works manufactures Pacific Centrifugal Pumps for municipal, industrial, refinery, pipe line and hot oil service, deep well centrifugal turbines and deep well oil pumps. Dresser Mfg. Co., the parent company manufactures Dresser Pipe Couplings and Pipe Line Repair Devices. Clark Bros. Co., of Olean, New York, manufacturers of Compressors and gas engines, and Bryant Heater Co., of Cleveland, Ohio, manufacturers of gas heating and air conditioning equipment, are also subsidiaries of Dresser Mfg. Co.

Synthetic Rubber Capacity Boosted

Plans for increasing this country's production of various types of synthetic rubber as part of the defense program are proceeding rapidly. Present plans apparently will call for an ultimate production of around 100,000 tons of synthetic rubber in this country, which will provide 16 per cent to 20 per cent of our total rubber requirements of 500,000 to 600,000 tons a year. Chemical companies, leading oil refiners, and tire manufacturers have all taken part in government conferences to lay out the program, and Jesse Jones, head of the RFC, has indicated that the government stands ready to provide funds for major plant construction for defense needs when plans are fully matured. At the moment, private industry is going ahead on its own, and present plans call for an annual capacity of at least 20,000 tons by the fall of next year. Since total consumption of synthetic rubber in this country last year was less than 2,000 tons, the extent of the expansion is obvious. All of this new capacity will be needed by industry for ordinary peace time requirements to fill the new uses that have been developed.

San Joaquin Valley

Texaco Reenters Cantua Creek Area

In an effort to find commercial production along a much drilled northwesterly trend through the Cantua Creek district of Fresno county, The Texas Co. has poured foundation for S.P. No. 27-13 in the southwest corner of sec. 13,17-15.

The 15th well to be drilled in the immediate area to depths of 6500 to 12,300 ft., the current try is but a half mile northeast of the company's S.P. No. 1 which flowed a small amount of salt water, condensate and gas from the Eocene interval 9353 to 9413 ft.

Jergins Well Flows Salt Water

Cheney Ranch No. 2, Jergins Oil Co.'s second test of the Cheney Ranch holdings in the Mendota area of Fresno county, flowed salt water on an attempted completion from plugged bottom at 7280 ft.

In sec. 29,14-13, one location southeast of the original well, the try was bottomed at 7354 ft. in gray sand. With a 7-in. water string cemented at 7200 ft. and 5-in. liner landed on bottom, the drilling mud was replaced with oil and the well was swabbed in at a 200 bbl. rate. After a 3½-hour flow the well died, then of itself again kicked over flowing salt water at a 1000 bbl. rate. At last report a water witch was attempting to locate the source.

The first well found high pressure but low volume gas sands at the 7200 ft. level with nothing of moment below to bottom at 9345 ft.

Union Ave. "Cat" Standing Plugged

Hancock Oil Co.'s Roberts No. 1, in sec. 6,30-29 at the southerly limits of the city of Bakersfield, was bottomed at 5593 ft. and is standing plugged to 5380 ft. with 100 sacks of cement. Seven inch casing has been cemented at 5350 ft. for tests of showings below 4100 ft. where both Chanac and Santa Margarita offer possibilities.

Greeley Well Finds Vedder Zone Barren

First well to miss Vedder zone production within the expected limits of the Greeley field is Standard Oil Co.'s KCL No. 11-25. Located at the east flank of the field, near the west quarter corner of sec. 17,29-26, the well entered the Vedder at 11,642 ft. finding only the top 8 ft. of the zone to carry oil stains with the balance all gray. Bottomed at 11,696 ft. the well was still drilling in gray sand at last report.

Only one location or a quarter of a mile due east of Standard's No. 11-22, a Vedder zone producer, the well was found to be 250 ft. lower on structure. The wide variance in zone tops in such a relatively short distance indicates steep dips along the easterly flank of the field.

It was known from previous wildcat drilling that a major disturbance occurred along the east flank, but this is the first well to accurately peg the trouble.

Kern Valley Company Works in Edison Area

Last reported temporarily halted at 315 ft., Kern Valley Drilling Co.'s Williams No. 1 in sec. 30,30-30 is the sole drilling rig in the area. Located two miles southeast of the Edison field, the current operation is the first in the section although many shallow wells have been dug in the general district.

South Dome Well Flows Salt Water

Bristol Oil Co.'s Smith No. 1 in sec. 35,24-19 at Kettleman South Dome, flowed salt water through perforations in 9-in. casing from 4957 to 4990 ft. and is being re-shot from 4770 to 4950 ft.

Bristol is carrying out a perforating and testing program on the old 8054 ft. well, drilled by Ohio Oil Co. in 1930, on the theory that possible sands might have been cased off in the original operation.

Honolulu Oil Corp. Makes Electric Record

High up on the Buena Vista hills, in sec. 10,32-24, an electric rig designed for only moderate depth is resolutely making hole in tough brown shale below 11,585 ft. This depth is believed to represent a record for electric power.

The well, No. 25-P, is operated by Honolulu Oil Corp., and is intended as an exploratory hole to examine a section heretofore undrilled in the immediate area. Nothing of particular significance has been reported to date, although the proximity of the Temblor may be indicated by hard brown shale with streaks of lime and chert found at 11,100 ft. which appeared similar to the Gould Shale.

At the base of the hills, some 600 ft. below in sec. 1,32-24, General Petroleum Corp. drilled BVA No. 1 to 11,886 ft. In this hole the Stevens zone was found

SAN JOAQUIN VALLEY WILDCATS

Area	Well	No.	Section	Depth	Status
	Fresno County				
Cantua Creek	The Texas Co., S. P.	27–13	13, 17-15		Foundation
Coalinga	Lewis, C. H.	1	18, 21-15	2298	Idle
Gatos Creek	Gatos Creek Oil Co.	1	19 19-13	725	Idle
Mendota	Jergins Oil Co., Cheney Ranch	1	29, 14-13	9345	Idle
		2	29, 14-13	7354	Testing
	Kern County				
Belridge—South	DeLanty & Sutton, Trustees	1	28, 28-22	3020	Idle
	Santa Mora Oil Co.	1	10, 28-20	544	Idle
Buttonwillow	The Texas Co., S. P.	47–15	15. 29-24		Rigging up
Devils Den	Herzog, R. D., Marine	28	26, 25-18	141	Idle
	Herzog, R. D., Marine	1	26, 25-18	708	Idle
Edison	Goodrum & Vincent, Inc., S. P.	7	31, 29-30	460	Idle
	Kern Valley Drlg. Co., Williams	1	30, 30-30	316	Idle
Grapevine	Kern Line Oil Co.	1	19, 11-19	8320	Stdg. cem.
	Richfield Oil Corp., Tejon Ranch	1	2, 10-19	9576	Drilling
Lost Hills	Argo Pet. Corp., Farnsworth	1-A	11, 26-20	1332	Pumping
	Randan Pet. Corp., Theta	1	3, 26-20	1625	Idle
McKittrick	Smith, Ebert E., Smithhart	1	34, 30-22	2278	Idle
Richgrove	Borget, A. J., Kendall	1	16, 25-27	40	Idle
Round Mountain	Spartan Drlg. Co., Hiatt	1	32, 28-29	2085	Idle
	Brown, E. C., Gibson	1	5, 28-29	1252	Abandoned
	Crestmont Oil Co., Russell	1	6, 28-29	110	Drilling
Shafter	Continental Oil Co., KCL	C–2	35, 27-24		Rigging up
Strand	Tide Water Assoc. Oil Co., KCL	56–8	8, 30-26		Location
Union Avenue	Hancock Oil Co., Roberts	1	6, 30-28	5593	Stdg. plugged
Wheeler Ridge	Richfield Oil Corp.	KCL 2	28, 11-20	11196	Drilling
	Kings County				
Pyramid Hills	Bristol Oil Co., Smith	1	35, 24-19	8054	Testing
	Pyramid Prod. Co., Spreckles	2	16, 24-18		Rig
Reef Ridge	Blair Oil Co., Blair	1	24, 23-16	72	Idle

at 10,560 ft. with the first sand 10 ft. below the top of the zone. Formation below 11,600 ft. was reported to be 35% sand of a tight impermeable nature, and the well was abandoned without testing.

Another to try the deep horizon was Shell Oil Co. in BVA No. 45-8 at the south edge of Buena Vista Lake in sec. 9,32-25. This well was abandoned at 12,027 ft. after finding only streaks of oil stained sands at intervals below 10,165 ft. and likewise was never tested.

2 Paloma Wells Below 10,000 Ft.

Ohio Oil Co.'s KCL No. 9-83-4, near the east quarter corner of sec. 4,32-26 at the westerly limits of Paloma production, entered oil sand at 10,007 ft. and was last reported at 10,030 ft. The oil sand was found 63 ft. lower than the first sand in Ohio's B-3-23-3, one location to the east and nearest production to the current extension try. Oil sand in the producer carried from 9945 to 10,269 ft. and flowed 1346 bbls. of 46.7 gravity oil through a 34/64 in. bean with more than 7,000,000 cu. ft. of gas.

Near the northwest corner of sec. 12, 32-26 Western Gulf Oil Co., discoverer of the field, is attempting a southeasterly extension of proved limits in KCL No. B-12-12. The well is drilling at 10,164 ft. with the objective Stevens horizon expected near the 10,500 ft. mark. A completion here will extend the field a mile southeast of the nearest producer, Western Gulf's KCL No. A-34-2, which found the sands from 10,311 to 10,711 ft. and flowed 720 bbls. of 54.5 gravity condensate with 6,500,000 cu. ft. of gas through a 24/64 in. orifice. The high gravity indicates that this well is high on structure in a gas cap area, and it is possible that a completion in the present driller will yield more black oil with a more favorable gas-oil ratio.

A unitization plan for proper development and administration of the field is under discussion by lease holders, but accomplishment of the purpose is being held in abeyance until outpost drilling more clearly defines the area to be encompassed and finds whether more black oil will be found down dip from the first wells. Re-pressuring and conservation plans must naturally be predicated on a sound knowledge of reservoirs; information which can only be obtained after this and other outpost drilling has been done.

Texaco Rigging Up Buttonwillow Test

The Texas Co.'s proposed test of deep sand possibilities of the Buttonwillow area, S. P. No. 47-15, is rigging up.

Located in sec. 15,29-24, the well is between two previous deep tests; California Exploration Co.'s 12,989 ft. well in section 7 and Union Oil Co.'s Bowerbank well in section 23 which was abandoned at 12,144 ft.

Sand bodies were found at many levels in each of the former wells, all of which proved too tight and impermeable to afford a reservoir for accumulation.

Since sand bodies are known to exist in the area, the trick here seems to be to find a closure containing sands of a permeable nature.

Conoco Rigs Shafter Try

Continental Oil Co. is rigging up KCL No. C-2 to drill a deep test in the northeast quarter of sec. 35,27-24 in the Shafter area.

The location is on a trend between the Wasco and Rio Bravo fields, which has been repeatedly drilled to the 13,000 ft. mark by Continental and others who believe the area to hold promise of commercial production.

Test Delayed in Grapevine Well

With 6⅝-in. casing still standing cemented at 8200 ft., production tests of Kern Line Oil Co.'s 8320 ft. well No. 1 in sec. 19,11-19 are delayed. Showings marked on electric log, against which there is little to correlate, and only fragmentary cores, are as yet the only signs of promise.

To the southeast in sec. 2,10-19, Richfield Oil Corp.'s Tejon Ranch No. 1 is coring ahead in sandy shale at 9580 ft. This well is also exploring a section about which little is known.

Wheeler Ridge Try Drills Siltstone

Richfield Oil Corp.'s Wheeler Ridge-KCL No. 2, second deep test up on Wheeler Ridge and south of the shallow field of the same name, was last reported at 11,195 ft. in siltstone. This well, in sec. 28,11-20, afforded great disappointment by flowing salt water with only a trace of high gravity oil on a test of sands at 10,934 ft. which appeared capable of production. Obviously proved to be wet, the sands had the appearance and character of high pressure oil sands found at depth in north Valley fields. Base of the gray sand was found at 11,050 ft.

One Starts: One Quits In Round Mountain Area

Again moving into the Round Mountain field activity, Crestmont Oil Co. has let a drilling contract to M.C.A. Drilling Co. for Russell No. 1 in the northwest quarter of sec. 6,28-29. Contractors were last reported rigging up to dig for the objective Vedder zone.

E. C. Brown's attempt to extend Round Mountain production over the line into the southwest quarter of sec. 5,28-29 failed when Gibson No. 1 went on the hook at 1252 ft. The well was bottomed in Walker clay after finding barren Vedder sands at 830 ft.

Belridge Field Activity Lags

With one drilling, one rigging up and one merely a derrick, only three active projects show a temporary lull in Belridge field activity. Belridge Oil Co. recently finished Nos. 45-35 and 63-35 for the customary 200 to 300 bbls. of high gravity oil and 3,000,000 to 10,000,000 cu. ft. of gas from the deep zones below 8000 ft.

Lytle Completes Kettleman Well

Latest to complete from Kettleman Eocene sands is Robert S. Lytle; Operator Felix No. 5. Located at the northeast flank of the North Dome field in sec. 35,21-17, the well initialed a 500 bbl. rate of clean 47.4 gravity oil and an estimated 50,000,000 cu. ft. of gas.

Bottomed at 10,872 ft., the well found the McAdams zone, top sand body of the Eocene, at 10,542 ft. A 6⅝-in. water string was cemented at 10,540 ft. and 4¾-in. liner including 336 ft. of perforation landed on bottom.

The Lytle well is an important indication that the Eocene sands are present in productive form over the entire north half of the field, and strengthens the belief that they will be productive over the entire region.

At the extreme south tip of the field, in the northwest corner of sec. 1,23-18, Standard Oil Co.'s No. 1-1U entered the McAdams at approximately 10,581 ft. and is bottomed at 10,970 ft. in hard sand. Casing is being run to try the sands. If the Eocene is found productive here it is generally conceded that the zone will be good over the entire field.

Standard Digging Elk Hills Deep Try

Prepared to go as deep as necessary, Standard Oil Co. is below 5000 ft. in well No. 42-31S on sec. 31,30-24 in the old Elk Hills field. With heavy equipment in use, the company is drilling carefully, having no intention to shatter any speed records.

A group of Standard's best drillers has been assembled for this important test.

Coastal District

Huasna Well Pumps Ninety Per Cent Water

"Tex" Harvey Oil Corp.'s Gilmore Community No. 1 in Huasna Valley is now on the pump with production running 300 bbls. a day about ten per cent of which is oil. There is still some reason to hope the well will become a commercial producer in that the salt content of the water is only 110 grains per gallon lending support to the theory that much drilling fluid remains in the formation. If it is possible to exhaust the water, the operator believes oil will enter the hole at a greatly increased rate. At present the fluid contains a large amount of dissolved tuff which is probably coming from a 40 ft. bed encountered near the 4518 ft. bottom.

Casing in this well was set at 3530 ft., below the fractured Monterey shale from which other wells in the area have produced small quantities of 13 gravity oil. Open to production is a 990 ft. interval consisting of black shale which showed oil in the partings and contained streaks of tuff and diabase. Gravity of the present yield is said to be 26 degrees.

Derrick is up for a second well which is scheduled for a test of the Temblor not reached by the first. Rigging up and spudding awaits favorable weather conditions as roads are unsafe for heavy hauling during the rains.

Transoceanic Finishes New Mesa Field Pumper

Transoceanic Oil Corp. added another well to its string of Santa Barbara Mesa producers when it completed M'divani-Wallace No. 1-A at the turn of the year. With only twenty feet open from the shoe of the 7-in. casing at 1685 ft. to bottom at 1705 ft., initial production was reported to be 25 bbls. per day.

Santa Maria Well Flows 760 Bbl. Rate

Flowing initially at a rate in excess of 760 bbls. a day, Union Oil Co. completed Morrison No. 3 as the largest new well at Santa Maria in some time. Located near the hot spot of three years ago in sec. 27,10-34, the hole was carried to 5125 ft. where 5¾-in. casing including 277 ft. of perforations on bottom was landed and cemented at 4830 ft. After the flow test the well was shut in to conform to the curtailment program.

Le Roy No. 6 at the west end of the field was finished by Union pumping 125 bbls. of 17 gravity oil cutting 3.0%. Perforations are open from 4920 to 5045 ft.

Union Oil Co. has two wells actively drilling, Vincent No. 6 in sec. 25,10-34 and Fleisher No. 1 in sec. 31,10-33.

Heavy Rains Hamper Ventura County Wells

Drilling in many sections of Ventura county has been seriously hampered by the heavy rains which have rendered roads either entirely impassable or unsafe for the hauling of equipment and supplies. The rough topography of the areas, where most of the wildcatting is now being done, necessitates much difficult road building before even a derrick can be erected and after the rains have made torrents of the usually dry canyons it is often necessary to spend days and even weeks in re-establishing communication with the world.

More fortunate than many operators, The Texas Co. has been able to work continuously on its No. 140 in the Shiells Canyon field. Casing was cemented at 3372 ft. and with bottom at 3545 ft., the hole is being prepared for a production test.

Signal Petroleum Co. of California has been able to operate most of the time and is reported below 2000 ft. in its test of Hopper Canyon.

Ventura Ave. Well Flows 3260 Bbl. Rate

One of the largest Ventura Avenue wells in a long time was recently obtained by Shell Oil Co. in the completion of No. 128 on the large Taylor property. Open in the interval from 6660 ft. to 7950 ft., a flow test established a potential of 3260 bbls. per day of 30.1 gravity oil cutting 1.2% and 2,590,000 cu. ft. of gas.

Lloyd Corp. is drilling No. 6 below 10,000 ft. and is preparing to spud No. 7.

Two Wells Drill In Oxnard Area

At the present time two wells are drilling in the vicinity of Oxnard on the plains southeast of Ventura. Resuming operations after a short period of idleness at 5000 ft., E. A. Bender is below 5300 ft. while The Texas Co.'s Montgomery No. 1 has passed the 6500 ft. mark.

The Bender well, now reported backed

COASTAL COUNTIES WILDCATS

Area	Well	No.	Section	Depth	Status
Santa Barbara County					
Elwood	Bolsa Chica Oil Co., Permit	191-7	24, 4-29	4313	Idle
	The Texas Co., Bishop	A-2	13, 4-29		Rigging up
Goleta	Coates, Spencer D.. Hollister	2-A	3, 4-29	1570	Idle
Summerland	Barnato Corp.. The, Hyland	1	16, 4-26	3415	Idle
San Luis Obispo County					
Huasna	Tex Harvey Oil Corp., Gilmore Comm.	1	11, 32-14	4518	Pumping
	Tex Harvey Oil Corp., Gilmore Comm.	2	11, 32-14		Rig
Ventura County					
Bardsdale	American Seamless Tube Corp., Basola	1	5, 3-19	3140	Pumping
	Elkins Reed	1	5, 3-19	902	Idle
	Hopland Oil Co.	1	1, 3-19	985	Idle
	Palma Oil Co., Elkins	1	8, 3-19		Grade
	Westoil Corp.	1	6, 3-19	525	Idle
Conejo	Sulphur Springs Oil Co., Janss	1	33, 2-19	4526	Idle
Ojai	Seaport Oil Corp., Arnett	3	15, 4-21	2532	Swabbing
	Norwood Oil Co., Coronet	4	17, 4-21	3250	Bailing
	Per-Col Oil Co., Anlauf	6	21, 4-21	2105	Idle
Oxnard	Bender, E. A., Farrell	1A	5, 1-22	5602	Drilling
	The Texas Co., Montgomery	1	13, 2-22	6360	Drilling
Piru	Nelson, D. V., P.F.C.—C.H.	1	19, 4-18	810	Drilling
	Oilexco, Inc., Newhall-Lund	2	2, 3-18	570	Idle
	Oilexco, Inc., Stevens	1	34, 4-18	373	Idle
Sespe	Inter Counties Fuel Co.	1A	22, 4-19	500	Idle
	Riley, Irene Burson	1	18, 4-19	2050	Idle
	Rio Hondo Oil Co., Cosby	1	14, 4-19	1695	Idle
	Signal Petroleum Co.	7	13, 4-19	1966	Drilling
South Mountain	Bolling Oil Co., Schieferle	1	17, 3-29		Cellar
	Calif. Securities Oil Co., Schieferle	1	17, 3-29	4501	Pumping
	Comstock Pet. Co.	1	17, 3-29	1800	Idle
	South Mountain Oil Co.	1	10, 3-20		Rigging up
Sulphur Mt.	Madison Oil Co., Delphy	1	24, 2-22	2500	Idle

by Southern California Petroleum Corp., has encountered several streaks of heavy tar sand in the Pico but so far has not entered its objective, the Repetto. The well seeks an entrapment along an ancient shoreline.

Conoco Completes San Miguelito Well

Starting the new year right, Continental Oil Co. brought in another big well on the Grubb lease at San Miguelito. The new producer, No. 20, flowed initially over 1500 bbls. a day of 30 gravity oil through a 48/64 in. bean together with 1,300,000 cu. ft. of wet gas, indicating a potential of more than 2000 bbls.

Seven inch casing was cemented at 6150 ft. and the hole bottomed at 6900 ft. where perforated liner was landed.

Equipment has been moved to No. 21 which is scheduled for immediate drilling.

Lane-Wells Introduces Radioactivity Logging

Radioactivity Well Logging Service will be available to oil well operators from the Houston, Texas office of the Lane-Wells Co. according to an announcement made by M. E. Montrose, General Sales Manager.

Lane-Wells Radioactivity Well Logging is an advanced method of determining bore hole formation characteristics in both cased and uncased holes. Formations are reliably logged through as many as three strings of cemented casing. Results are not influenced by the fluid content of the bore hole, and Radioactivity logs made in open hole with very salty mud, or with oil base drilling fluid, have full details and are easily correlated with logs made in wells which are already cased.

Franks Mfg. Employes Get Christmas Bonus

A $20,000 bonus for some 300 employes, one of the largest Christmas "mellons" to be cut by oil equipment manufacturers was divided this year by the Franks Manufacturing Corp., of Tulsa.

Carl White, Jr., vice-president and one of the owners, acted as Santa Claus when the bonus, which was divided in accordance with years of service, was presented to the employes.

The Franks organization, which had seven employes in 1930, when it was organized, now has more than 300. The organization produces oil well servicing and drilling equipment, from pulling winches to portable rotary drilling rigs and truck-mounted telescoping servicing units, including derricks. Units are in use in every major field in the United States and in Peru, Venezuela, Colombia, Roumania, Greece, Russia, and Japan.

American Meter Co. Liquefied Gas Meters

American Meter Co. has issued an authoritative new bulletin on Liquefied Petroleum Gas Meters.

Especially helpful is the section devoted to "Specifications for Ordering Liquefied Petroleum Gas Meters." It is based directly upon American Meter Co. experience in providing—from the very beginning of the industry—specially-constructed meters in a range sufficiently wide to cover all butane-propane applications. Such meters therefore have been adequately tested and approved; the performance records of thousands of actual installations throughout the field have been continuously checked and rechecked.

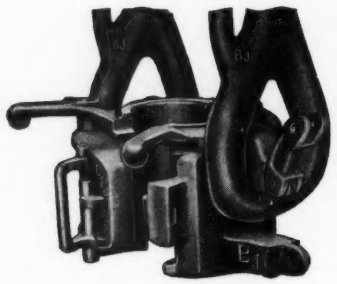
The booklet confines itself to the essentials of LPG metering practice, is generously illustrated and designed for easy reference.

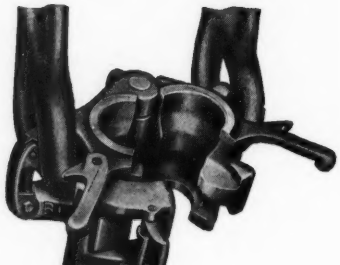
New Curved Link Block on BJ Elevators

These curved Link Blocks provide additional safety in retaining links under the elevator trunnions and permit greater freedom of movement of the elevator links when the elevator is being opened and closed. The Link Blocks are permanently hinged at the top, close downwardly, and are securely bolted in place. Thus, they provide a closed C-link which both retains the elevators and increases the strength of the elevator trunnions.

The new Link Blocks are standard on BJ Type A Elevator as well as all other modern BJ Elevators, but are not interchangeable on previous types of elevators.

A catalog fully describing and illustrating these Link Blocks is available from Byron Jackson Co., P. O. Box 2017 Terminal Annex, Los Angeles, Calif.





Elwood Wildcat Ready to Spud

Nearly ready to spud is the word received from The Texas Co.'s Bishop No. A-2 which will seek a new Vaqueros field north of the State Highway in the Elwood area of Santa Barbara county. This is the company's second attempt within a year, the first having found the objective formation barren at 3300 ft. Although definitely wet, the sand had a distinct odor of gasoline.

New Lane-Wells House Organ Format

"Tomorrow's Tools—Today," published by Lane-Wells Co., Technical Oil Field Services, will appear in a new format beginning with the January 1941 issue.

The magazine, which has a circulation of ten thousand copies among oil company engineers and field operators, has published development articles about Lane-Wells Gun Perforator, Electrolog and Oil Well Survey Services, and complete abstracts of all "drilling" and "production" papers appearing in current petroleum magazines. These two departments will be retained and new features will be added. Interesting stories and photographs, supplied by leading national outdoor publications, will appear regularly. Front cover plates will be reproductions of outstanding oil company house organs. A puzzle contest and a picture contest will be included.

Elementary Organic Chemistry in Valuation

and Utilization of Hydrocarbons

By J. G. Schaafsma
General Petroleum Corporation of California

Presented before C.N.G.A. January 2, 1941

I—The Change in Concept

Oil was originally evaluated almost entirely on a basis of gravity. This applied to both crude and gasoline. The latter was merely a volatile colorless liquid of low viscosity considered only in the mass as we consider residual fuel oil at present.

Increased strictness of demand by various consumers stimulated methods of analysis of oils, and isolation of the various hydrocarbon groups and individuals in petroleum. Properties of the various constitutents were determined so that the relative desirability of a great number of the hydrocarbons in gasoline and other products are accurately known. Some men even hold up the ideal of single compounds, either natural or synthetic, for each of the various purposes such as motor gasoline, aviation gasoline, and even lube oils.

The petroleum industry is becoming more and more a chemical industry, not merely because of increased emphasis on synthetic products, but also due to the realization that the chemical nature of the various petroleum distillates and gases is a very important factor in the value and utilization of these products.

II—The Hydrocarbon Groups

Although it represents a repetition of known facts, for the purpose of future reference in this talk, the hydrocarbon groups will be briefly discussed, especially since petroleum chemists have their own ideas as to the relative importance of these various groups.

1. The simplest group contains the normal or straight chain paraffins, which are merely strings of carbon atom beads with each of the four carbon bonds connected either to adjacent carbon atoms or to a hydrogen atom. (Fig. 1.) Each C atom has four bonds and each H only one and that there are never any unattached bonds. In order to more clearly show the carbon skeleton, the H atoms have not been drawn in.

2. Iso or branched chain paraffins are considered as a separate group by petroleum engineers, although their carbon-hydrogen ratio is the same as for normal paraffins and their chemical properties are very similar. Their behavior in the internal combustion engine makes them much more desirable than the normal paraffins. Chemists also have found that compounds in which one carbon atom is attached to three others are more chemically reactive than those in which all of the C atoms are attached to one or two others. This makes iso-paraffins more useful for synthesis.

3. Naphthenes, or cycloparaffins, consist of rings of 3 or more carbon atoms each, with or without straight or branched side chains. For example a five membered ring with a single carbon atom side chain could be methyl cyclopentane. Five and six carbon atom rings predominate over other naphthenes in peroleum products.

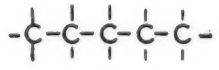
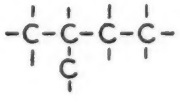
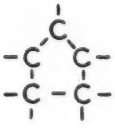
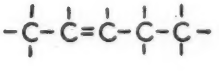
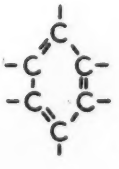
4. Aromatic compounds are similar to naphthenes with six membered rings, but contain less hydrogen. Benzene and Toluene are familiar examples of aromatics found in straight run gasoline, but are found more commonly in the distillates obtained in the coking of coal. Aromatic compounds always contain the characteristic six membered ring shown in Figure 1. The deficiency in hydrogen is made up by the alternate double bonds. As in naphthenes side groups consisting of paraffins, naphthenes, or even other aromatics, may replace one or more of the hydrogen atoms.

5. Unsaturated compounds are similar to paraffins and naphthenes but contain less hydrogen, resulting in the chemically active double bonds. Such compounds occur to a small extent in straight run products but are very important in cracked products. Although more stable thermally, the double bond is less stable chemically than a single bond and readily reacts with compounds like chlorine, sulphuric acid and other hydrocarbons.

When we consider the various families into which we can place a C_8 hydrocarbon, for example, and then consider how many possible ways this hydrocarbon can vary in its own family, we can readily understand why it is that a crude oil contains thousands of different compounds.

We are all familiar with the fact that there is only one C-3 paraffin, propane, and two C-4 paraffins, N-butane and isobutane. As the number of carbon atoms increases, the number of possible com-

FIGURE 1

PARAFFINS	C_nH_{2n+2}	C_5H_{12}	
ISOPARAFFINS	C_nH_{2n+2}	C_5H_{12}	
NAPHTHENE	C_nH_{2n}	C_5H_{10}	
OLEFINES	C_nH_{2n}	C_5H_{10}	
AROMATICS		C_6H_6	

binations or isomers increases at a much faster rate.

Figure 2

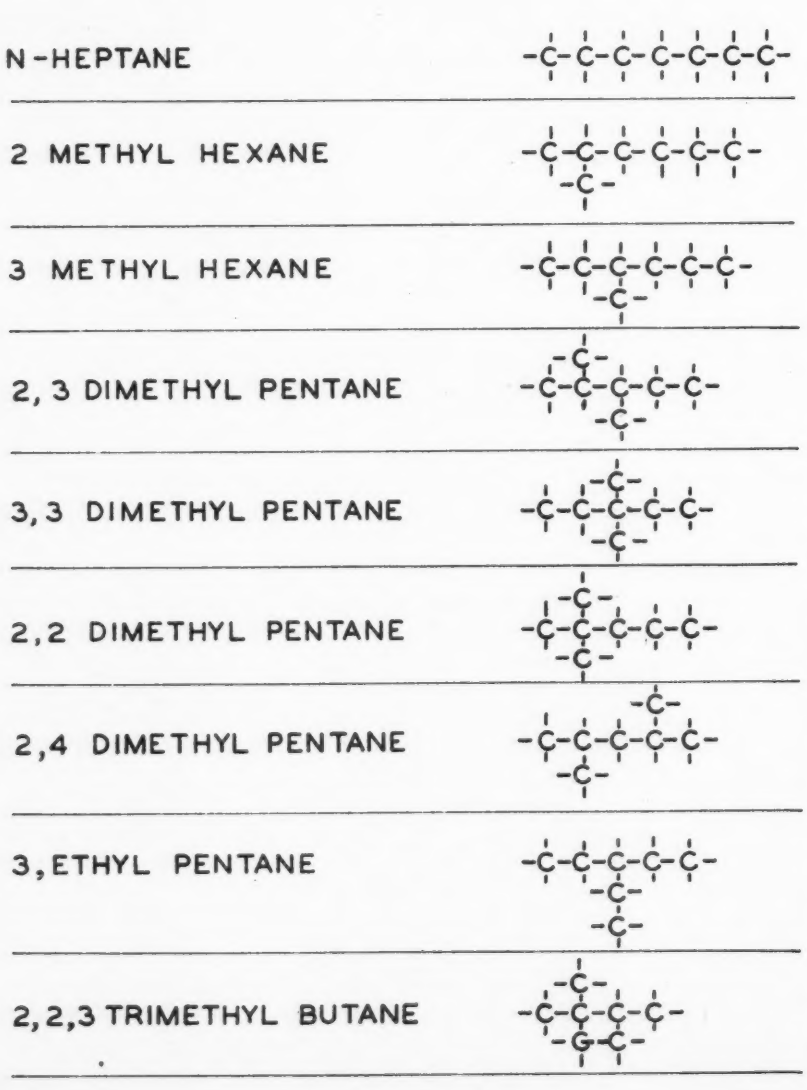
Here are shown the nine possible heptanes. All of them have been prepared in the pure state, and so far, at least six of them have been found in peroleum. Each one has its own characteristic boiling point, gravity, octane number, etc. Calculations show that 18 octanes, 34 C-9's, 75 C-10's, 1858 C-14's and 366,319 C-20's must exist in the normal and isoparaffin groups alone.

Figures 3

This chart shows how, for the C-6's, the physical properties vary between the groups. These properties are not necessarily the same for members of the same groups, as one goes to more or less carbon atoms per molecule. Octane numbers of higher boiling naphthenes, for example, become very low, while those of aromatics remain in the neighborhood of 100. Normal paraffins decrease rapidly in octane number with increase in boiling point, while those of isoparaffins tend to remain high. The paraffins overtake the other groups in melting point, becoming solid waxes at a much lower molecular weight than do naphthenes, unsaturates, aromatics. Chemical stability refers to the resistance to reaction with other chemicals. As has been already pointed out, the isoparaffins contain one or more carbon atoms which are attached to three other carbons, making this group appreciably more reactive than normal paraffins. The double bonds in unsaturated compounds are very reactive even at room temperatures and without catalysts. Aromatics are also reactive, but the reactions are principally concerned with the hydrogen or other groups attached to the ring, the very stable six-membered ring being broken or altered only by the most severe reagents and conditions. This high stability of the ring is also true of thermal reactions, low boiling aromatics surviving temperatures that destroy all of the other groups.

FIGURE 2

THE 9 ISOMERIC HEPTANES



III—The Hydrocarbon Range of Various Products

We are now in a position to see just how these various groups, and even their individual members, are distributed throughout the marketable materials whose physical aspects are already so familiar. It is only within the past few years that we have been able, with reasonable certainty, to say what kind of compounds are present in various oils; and even yet most of the constituents of the average crude oil are unknown.

Have you ever wondered just how many carbon atoms are in the heaviest compounds in ordinary gasoline? Or whether paraffin wax was C_{20} or C_{30}? Let us classify some of our products as to their hydrocarbon range.

1. Fuel gas, of course, is usually considered to contain only C_1, C_2, C_3, and C_4, the latter usually including only isobutane, since normal butane can be used to advantage in gasoline.

2. Some C_3 and C_4 can be used as bottled gas at a better price than fuel gas.

3. The first product whose constituent parts are still relatively unknown is natural gasoline. An ASTM distillation of a typical 20# RVP natural gasoline shows a boiling range of 76° F. to 320° F. This would mean the possible inclusion of small amounts of decane isomers (C-10's) of naphthenes such as propyl cyclohexane and butyl cyclopentane, and of aromatics such as xylenes and propyl benzene. The bulk of the gasoline, of course, consists of butanes, pentanes (C-5's) and hexanes (C-6's).

4. Aviation gasoline as cut from crude oil contains just about the same range of compounds as natural gasoline, but the distribution is such as to include a relatively larger amount of heptanes, octanes and nonanes. Since aviation gasoline is fractionated to end point it may actually be free of the highest boiling materials found in natural gasoline. The percentage of butanes, however, is even less than in motor gasoline, this being done to prevent vapor lock in service.

5. Motor gasoline with a 400° F. EP

can possibly include all of the paraffinic and naphthenic C-11's and most of the aromatic C-11's such as the amyl benzenes.

6. Similarly, kerosene with a 370 to 540° F. boiling range (ASTM) includes from C-11 through C-16, while a 650° F. EP diesel oil may range from C-11 or C-12 to C-20.

7. Above C-20 a very marked difference in the hydrocarbon groups becomes apparent because the paraffins have melting points above room temperature while the other hydrocarbons are still liquid. Commercial paraffin wax has been shown to consist largely of straight chain paraffin of 23 to 28 carbon atoms per molecule and melting from 115° F. to 140° F. Cerese wax, a by-product of the solvent refining of lube oil, has a melting point of 176° F. which coresponds to C-40 or tetracontane. Waxes up to $C_{60}H_{122}$ have been isolated from crude oil.

8. Lube oils, medicinal oils, and heavy industrial oils can tolerate only negligible amounts of wax since small amounts of wax form a matrix which holds the rest of the oil in a semisolid form at temperatures above their minimum operating temperatures. These heavy oils consist of high boiling naphthenes and aromatics as well as high percentages of unsaturated compounds of very complicated structure. The boiling points of these oils are so high that they cannot be vaporized under normal pressures without decomposition and must be distilled with the aid of steam or vacuum to reduce the boiling point. A water-white medicinal mineral oil may be in the range of C-25 to C-30, while heavy lube oils will go much higher.

9. Fuel oil is in much the same position that was formerly held by gasoline. It is a black oil that burns and its viscosity, sediment and pour point are its only significant properties. Among its constituents are waxes, and aromatic and unsaturated compounds, highly branched and very deficient in hydrogen.

IV—Effect of Chemical Nature on Value and Utilization

Now that we have a rough idea of the distribution of the hydrocarbons throughout the finished products, let us see why their chemical nature has attracted so much attention. The value of the hydrocarbons, both individuals and groups, will be considered first of all as finished products without any chemical changes, and secondly as raw materials for synthetic processes.

1. C_1 and C_2—Methane and ethane are used in their original form almost entirely as low priced fuel gas. This holds true for ethylene from cracking stills, although it really is already a synthetic material.

2. C_2—C_4, Propanes and butanes find extensive use as fuel gas, but also are sold as bottled gas. The increased value of bottled gas over regular fuel gas is partially due to the higher heat content of C_3 and C_4 but principally to the fact that modern distillation methods enable one to efficiently separate those constituents which can be liquefied, hence putting a great quantity of material in a small, easily transported container. Unsaturated C-3 and C-4's, when used as is, go almost exclusively to refinery fuel gas.

3. Butanes in Gasoline.

Most of us are aware of the fact that their high vapor pressure is the only objection to the use of propane and isobutane in gasoline, since their octane numbers are close to 100. This holds true for the unsaturated C-4's, such as isobutene and 1-butene in cracked gases. Refiners try to put as much of the light hydrocarbons as possible in finished gasoline, the tendency to vapor lock being the limiting factor. Propane and, to a large extent, isobutane are excluded, while normal butane (and 2-butene in cracked gasoline) are retained. The advantage of a closely fractionated front end for gasolines can be seen from the fact that a 10-lb. RVP motor fuel will tolerate nearly five times as much n-butane as it will propane while a 22-lb. Reid Vapor Pressure natural will take 6.5 times as much. A refinery putting out a million barrels of motor gasoline a year containing only 0.1% C-3 is losing 5,000 barrels a year in liquid yield. Since n-butane and 2-butene have blending octane numbers of over 90, the gain is not only in volume.

4. Butane-Pentane shift.

In some cases, especially where gasoline is made for hot weather service, not all the n-butane available can be used in the motor fuel. To reduce this degrading of butane to fuel gas it has been suggested that all of the butane available be used in summer gasoline, the excess vapor pressure being reduced by the removal of pentanes which would then be stored under a slight pressure, for use in winter gasoline.

5. Production of pure pentanes.

The production of large quantities of synthetic isooctane for superaviation fuels has also created a demand for light blending stocks to add the necessary volatility. Part of this demand is supplied by isopentane (90 O.N.) which must be reasonably well separated from n-pentane (61 O.N.) boiling 14° F. higher. Here again we see how different the normal and isoparaffins are from the petroleum technologist's point of view.

6. Chemical Nature of Gasolines.

A high gravity gasoline is no longer a criterion of quality, since this may mean that the fuel contains a large amount of n-paraffins which not only are very light hydrocarbons but are also those that produce the greatest knock in an engine. Octane numbers of n-paraffins (n-butane at 92 excepted) range from 61 for n-pentane and 25 for n-hexane to 0 for n-heptane, –17 for n-octane and –45 for n-nonane. The importance of this is not so evident to us in California where straight run gasolines range from 60 to 70 O.N. unleaded. Some eastern crudes, Michigan, for example, yield gasolines of 20-30 octane number, which are totally unfit for modern motors and must be cracked to increase octane number. In passing, an example can be found here of the importance of knowing just what compounds are present in a particular gasoline, or other product. These very paraffinic gasolines of low octane number and low value may suddenly become very desirable as a source of n-heptane for use in the synthesis of toluene.

Branched chain or iso paraffins are very different from their straight chain isomers, their octane number ranging from

FIGURE 3
PROPERTIES OF SOME C_6'S

	N-HEXANE	NEOHEXANE	CYCLOHEXANE	N-HEXENE	BENZENE
BOILING PT. F	155.7	121.5	178.5	145.0	176.3
MELTING PT F	-137.7	-144.8	43.7	-145.3	41.9
A.P.I. GRAVITY	81.3	84.5	49.3	76.6	28.9
VAPOR PRESSURE	5.0	9.8	3.4	6.0	3.2
A.S.T.M. OCTANE NO.	25	96	77	80	97
CHEM. STABILITY	HIGHEST	HIGH	INTERMEDIATE	LOWEST	LOW
THERMAL STAB.	LOW	LOWEST	INTERMEDIATE	HIGH	HIGHEST

85 to over 100. It is from this class that the superaviation fuels are selected, but unfortunately their percentage in natural sources is small, making synthetic processes necessary. Not only the branched chain C-8's, but also C-6's (neo hexane) are used; and branched chain C-7's, C-9's and C-10's would probably be useful if available.

California straight run gasolines are predominately naphthenic containing as much as ⅔ by volume of cyclic hydrocarbons. The latter fall between normal and iso paraffins in octane number, those without side chains or with short side chains having octane numbers between 70 and 85, while those with long C-3 to C-5 side chains having octane numbers of 25 to 30. Those occurring in California straight run aviation gasolines are mostly in the higher O.N. range. Since both paraffins and naphthenes decrease markedly in octane number with increased boiling point, the C-10 octane number difference between a low boiling aviation gasoline and the heavier motor gasoline from the same crude is readily understood.

Part of the relatively high octane number of California gasolines is due to aromatic hydrocarbons all of which have octane numbers in the neighborhood of 100. These offset the effects of the comparatively small amounts of n-paraffins present.

It might be thought that since aromatics have such high octane numbers that superaviation fuels would be made from the distillates of coal tar. Certain undesirable characteristics prevent their use where isoparaffins are available. The lightest member, benzene, can be used in only limited amounts because of its high freezing point (42° F.) which would cause carburetor trouble in cold weather. Specifications demand that the gasoline show no crystals forming at –76° F. Aromatics have a lower fuel value which would necessitate a heavier load of fuel for a given trip. In addition, aromatic compounds exhibit a lower octane number in a hot engine than in a cool engine, and would not perform as well as isoparaffins in high compression aviation engines.

One more property is of value in comparing various compounds in motor fuels and that is lead susceptibility. Various compounds undergo differing degrees of octane number increase upon the addition of tetra ethyl lead. Branched chain hydrocarbons, especially neohexane, have good susceptibility while unsaturated compounds are notably poor, thus making cracked gasoline require more lead for a given increase than straight run material. The presence of certain other compounds, especially those of sulphur, also markedly reduces the lead susceptibility, sometimes making justifiable considerable expense in reducing the sulphur content.

7. Distillates.

One might think that all of the big problems lie in gasoline manufacture, but that is far from true. Other products do not command as much attention because the market for them is smaller.

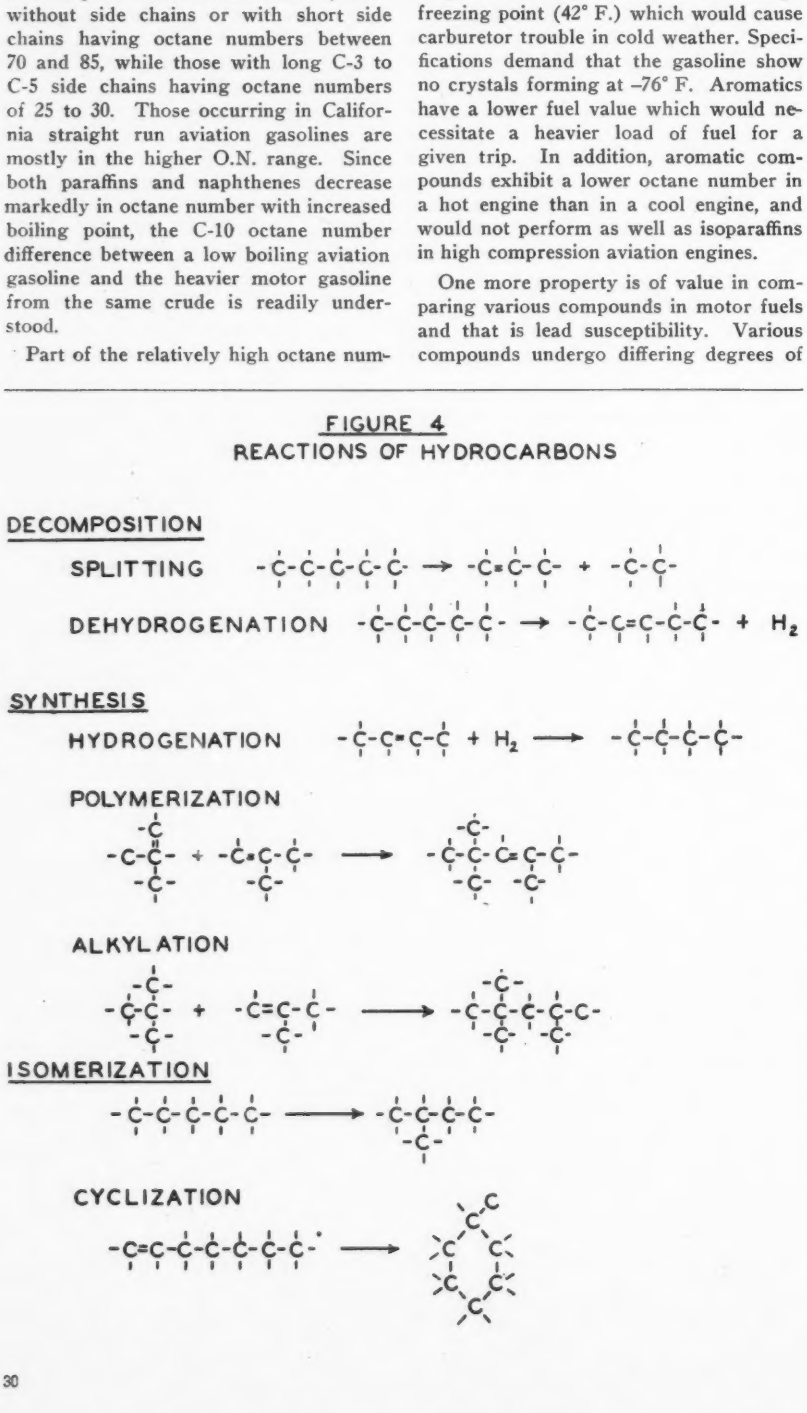
Kerosene, for example, has to undergo considerable treatment before it will burn with a clean, steady flame which will not smoke-up a chimney in a few hours. Experiments have shown that aromatics burn with a smoky flame and that an oil consisting principally of paraffins is most desirable for a burning oil. Hence refiners take advantage of the high chemical reactivity of aromatics in removing them by treatment with sulphuric acid. This, at the same time, stabilizes the water-white color of the oil over long periods of time, thus making the product more attractive to the consumer. Liquid sulphur dioxide is also used for treating kerosene. It selectively absorbs the aromatics.

Improvement in diesel engines has increased the demand for better quality diesel fuel. Unlike gasoline engines, the diesel engines require a low octaine number fuel which will ignite almost instantaneously, hence putting a premium on normal paraffins and naphthenes over isoparaffins and aromatics. While California crudes produce good gasolines, the diesel oil fractions often have acetane number well below specifications. An example is here available of the demands put upon petroleum technologists. The diesel engine operator wants a fuel of high cetane number (low octane number) which would indicate a maximum amount of normal paraffins, but with a low pour point, which would indicate a minimum of these same compounds. With advances in diesel engine design we can expect new demands on the inventiveness of the petroleum technologists and the consequent production of fuels far in advance of present specifications. Here, again, undesirable constituents such as aromatics may be removed by SO_2 extraction.

V—Value and Utilization of Hydrocarbons as Raw Materials

The role of the chemist is becoming increasingly important in that so many petroleum hydrocarbons have become raw materials for synthetic processes. This

FIGURE 4
REACTIONS OF HYDROCARBONS



has markedly increased the value of many materials formerly considered as low grade products. Many articles appear in journals and are read in engineering meetings concerning these modern techniques; and it may be opportune to take time here to review the more common reactions employed and get, as it were, a bird's-eye-view of the whole field.

Chemical reactions of the hydrocarbons may be divided into those of decomposition, of synthesis, and of isomerization. We may break down the hydrocarbons, build them up, or merely rearrange them.

Figure 4

The decomposition reactions are the primary reactions in the cracking of heavy oils and the reforming of gasolines. Splitting reactions produce both paraffins and olefins, and can form both liquid and gases if the original molecule is large enough. Dehydrogenation is merely the removal of hydrogen from a paraffin to form a molecule, or from a naphthene to form an aromatic, etc.

Hydrogenation is just the reverse of dehydrogenation and in the example shown it is used to convert 2-butene to n-butane. Polymerization is the term used for reactions in which two or more olefines combine under the influence of heat and pressure, or of catalysts, to form higher boiling olefines. Such reactions convert cracked gases into gasolines of excellent octane rating. Due, however, to the reactivity of the double bond which is still present, these polymer gasolines tend to form small amounts of very heavy resinous polymers on standing and are hence not acceptable as aviation fuels. However, hydrogenation converts them to isooctane and similar high octane number compounds. This is readily seen from the example given for polymerization. Paraffins are called alkanes under one system of nomenclature and from this we get the term alkylation, meaning the addition of a paraffinic group to any other group. Although formerly used principally for the additional of alkyl groups, such as methyl and ethyl, to benzene and other aromatics, the term has come to mean, at least to the oil industry, the addition of paraffins, especially isobutane, to olefines. This differs from polymerization in that it produces directly a saturated paraffin, thus avoiding the step of hydrogenation.

Isomerization involves merely a rearrangement of the existing atoms in the molecule. We have already seen what a great difference there is between, say, n-paraffins and isoparaffins with the same number of carbon and hydrogen atoms and hence any economical methods of isomerizing the former into the latter will be welcomed heartily. Cyclization is the isomerization of olefines to naphthenes of the same number of C and H atoms per molecule.

Our discussion will close with a brief glance at existing processes to see how these type reactions, singly or combined, are commercially employed.

Cracking for the conversion of heavy oils into gasoline and reforming for the transforming of heavy, low octane number gasolines into more volatile gasoline of higher anti-knock rating have been practiced for a long time and represent a combination of decomposition and synthesis. The first two reactions on Figure 4 are those which take place first of all in the tubes of a cracking furnace, but the other reactions shown also take place to a certain extent. Paraffins may again split or olefines may polymerize to form higher boiling olefines. Isomerization of olefines to naphthenes occurs to a considerable extent as well as dehydrogenation of these naphthenes to aromatics but alkylation probably does not occur appreciably. The final result is a range of products varying from methane to polymers of higher boiling point than the charge stocks, as well as coke from the dehydrogenation of heavy polymers, especially aromatics. Gasolines of up to 75 O.N. can be economically produced. By performing these cracking reactions in the presence of a catalyst such as activated clay, the reactions are guided towards the formation of branched chain hydrocarbons and aromatics, the net result being gasolines of much improved octane number and lower olefin content.

Polymerization of unsaturated C-3 and C-4 hydrocarbons from cracked gases may be accomplished without catalysts at low pressures (50-75 psi) and temperatures around 1200° F. By selection of proper catalysts the operating temperature may be drastically reduced, the polymerization of isobutene in the presence of sulphuric acid being accomplished at room temperatures. Thermal processes yield a variety of polymers, as well as naphthenes and aromatics, most of which are in the gasoline boiling range. Catalytic processes can be more closely controlled to yield principally dimers such as C-6, C-7 and C-8 olefines. Polymer gasolines (of 80-82 O.N.) are suitable for motor fuel but must be hydrogenated before they can be used for aviation gasoline. By limiting the charge to a catalytic unit of butenes, a high yield of unsaturated branched chain C-8 is obtained which can then be hydrogenated to isooctane of 100 O.N.

Alkylation is a valuable addition to the processes for producing superaviation fuels in that saturated branched chain hydrocarbons are produced in one step and also the yields of gasoline based on the unsaturated hydrocarbon are approximately doubled. This reaction may be accomplished thermally at about 950° F., but for all of the olefines, except ethylene, the pressures required are beyond commercial reach. Ethylene reacts with isobutane at 4500 psi to form neohexane, an excellent blending agent to add both volatility and O.N. to aviation gasoline. N-butane also reacts thermally, but is not used since the hexanes thus formed are of lower octane number. The alkylation of butenes with isobutane takes place at room temperature in the presence of sulphuric acid to form isooctane.

Isomerization has not yet reached the status of a commercial process, but suggests many valuable possibilities. One of these is the utilization of the zero octane number compound, n-heptane, now a very undesirable constituent of low grade gasoline. Should the demand for toluene for explosives become sufficiently great, processes are available whereby the heptane is dehydrogenated to heptene, isomerized to methyl cyclohexane, and then dehydrogenated to toluene all by the same catalyst.

In examining the type reactions shown on Figure 4, one might question whether dehydrogenation could not be employed to convert natural gas into more valuable olefines. In fact, this will become important as the demand for olefinic raw materials increases. By the use of high temperatures alone the paraffins may be converted to olefines. Ethane and propane, for example, can be converted principally to ethylene for neohexane synthesis at 1400° F. and about 10 psi, the propane splitting of methane as well as hydrogen. Propane-butane mixtures can be converted at lower temperatures. Catalytic process operating at milder conditions are also being developed to accomplish this dehydration.

Synthetic fuels are not the only new products which are increasing the value of petroleum hydrocarbons. Butenes are now being converted to such diversified materials as alcohols, lacquer solvents, and synthetic rubber, and all of the lighter olefines are being used to some extent to produce a variety of chemical products. Demands for raw materials will thus continually increase and the petroleum technologist must strive to keep up with, and, if possible, anticipate the demand. As in many other fields, here is a job that never ends. With synthetic gasoline a reality, we still can anticipate synthetic diesel oils and lube oils and we may very likely see the time when people will shake their heads over the extravagance of the days when people actually burned natural gas and straight run petroleum products and sold such a valuable material as crude oil for one dollar a barrel.

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Oil Men's Calendar

Calif. Natural Gasoline Association. **Los Angeles Chapter**—Meets 1st Thursday Each Month, Barker Bros. Bldg., Los Angeles—Dinner at 6:00 (Optional). **Taft Chapter**—Meets Third Thursday Each Month.

American Society of Mechanical Engineers—Los Angeles Section—Meets 2nd Thursday Each Month—Barker Bros. Bldg., Los Angeles. Dinner at 6:30 (Optional).

1941

January

16-17—Liquefied Petroleum Gas Assn., eastern section, regional meeting, N. Y.
20-21—Compressed Gas Manufacturers Assn. Inc., annual meeting, N. Y.

February

17-20—American Institute of Mining & Metallurgical Engineers, Engineering Societies Building and Commodore Hotel, New York.
19-21—Association of Highway Officials of North Atlantic States, Hotel Statler, Boston, Mass.
24-25—Liquefied Petroleum Gas Assn. Inc., annual convention, Chicago, Ill.
26-28—Iowa Independent Oil Jobbers Assn., Des Moines, Iowa.
27-28—American Petroleum Institute, Division of Production, Southwestern District, Washington - Youree Hotel, Shreveport, La.

March

3-7—American Society for Testing Materials, Hotel Mayflower, Washington, D. C.
11—American Petroleum Institute, Division of Production, spring meeting, Pacific Coast District, Biltmore Hotel, Los Angeles, Calif.
17-22—Oil Burner Institute's National Oil Burner Progress Exhibition, Commercial Museum, Philadelphia, Pa.
25—Oil Trades Assn. of New York, annual meeting, Waldorf-Astoria Hotel, New York.

April

2-4—American Assn. of Petroleum Geologists, 26th annual meeting, Rice Hotel, Houston, Texas.
7-11—American Chemical Society, St. Louis, Mo.
17-18—American Petroleum Institute, Division of Production, Wm. Penn Hotel, Pittsburgh, Pa.
23-25—Fuel Oil Distributors Assn., Asbury Park, N. J.
23-25 — Petroleum Industry Electrical Assn., Mayo Hotel, Tulsa, Okla.
23-25—Natural Gasoline Assn. of America, annual convention, Baker Hotel, Dallas.
24-25—National Petroleum Assn., Cleveland Hotel, Cleveland, Ohio.
25-26—Petroleum and Natural Gas Conference, State College, Pa.

May

5-8—American Gas Assn., Natural Gas Section, Dallas, Texas.
19-23—American Petroleum Institute, 11th mid-year meeting, Mayo Hotel, Tulsa, Okla.

June

23-27—American Society for Testing Materials, 44th annual meeting, Palmer House, Chicago, Ill.

November

3-7—American Petroleum Institute, 22nd annual meeting, San Francisco, Calif.